THE DENTAL PRACTITIONER

AND DENTAL RECORD

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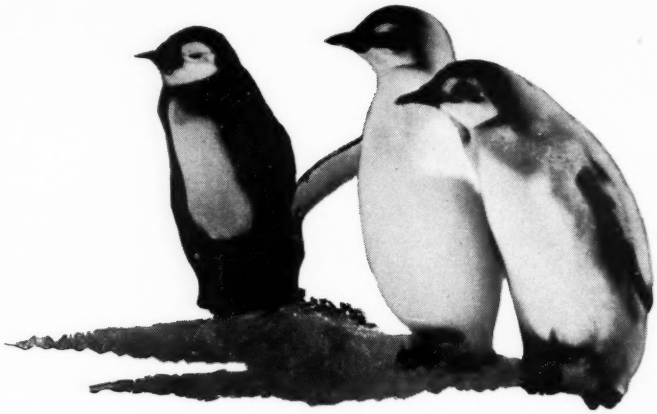

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THE DENTAL PRACTITIONER
AND DENTAL RECORD

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THE DENTAL PRACTITIONER AND DENTAL RECORD

Vol. X, No. 2 October, 1959

EDITORIAL

STUDY CLUBS

With the approach of winter, dental meetings are getting under way. Up and down the country notices have gone out to members telling of forthcoming events. These meetings should be the life-blood of the profession: the arteries for the exchange of up-to-date ideas. But it seems that the life-blood has got pretty sluggish and the arteries pretty hardened.

It appears that many of the members have become bored and uninterested.

Dental societies and associations are the backbone of the profession. They unify it. Through them the younger men receive advice from the more experienced; the older keep abreast of modern techniques and research. This interchange is important to a progressive professional body.

Surely this should be sufficient to create enthusiasm and interest? Apparently, it is not.

Perhaps the problem goes deeper than the usual reasons that are given . . . that the old guard always run things . . . there's no chance for younger members . . . that speakers are too erudite and their papers unconcerned with the problems of everyday practice. Perhaps they want something more out of a meeting. Something that makes it worthwhile to them individually.

Perhaps Study Clubs are the answer. In the United States these have proved tremendously successful (as they have already done in some parts of Britain).

The Study Club consists of eight or ten practitioners who band together, either within an existing organization or independently, to study various aspects of dentistry in which they are interested. They meet more or less frequently in each other's surgeries or nearby hospitals or dental schools. In some cases a different topic is discussed each evening, with all members taking part or, alternatively, the club exists for the study of one subject only.

In the United States clubs are usually devoted to single subjects such as gold foil, amalgam, dental medicine, perodontics, periodontia, and prosthetics, etc. Occasionally experts are brought in for special lectures, but, in the main, the work is done by the members. Some have developed research projects which have led to techniques and experimental results of considerable value to the profession at large. Many of the leading exponents in certain branches of dentistry in America have never been associated with dental schools or research laboratories but have gained their experience and reputation through Study Clubs.

This idea could be extended and developed in this country. It might well be the answer for dental practitioners who have lost interest in existing Dental Societies.

The Dental Practitioner believes that this is a worthwhile project, and the Editor will give whatever help and stimulus through the pages of the journal practitioners require, if they are interested.

FULL DENTURE CONSTRUCTION IN RELATION TO GENERAL PRACTICE

By **J. F. BATES**, M.Sc., B.D.S. (U.Durh.)
Turner Dental School, University of Manchester

UNDER the National Health Service a number of complaints arise, the majority of which are in connexion with full dentures. Whilst the complaint may be due to a variety of causes, it underlines the great skill which is required in full denture construction. Many of these failures are referred to the dental hospitals, and this paper is the result of the writer examining these patients and also many hundreds of others who attended for routine treatment with dentures made in the general dental service.

The aim of this paper, therefore, is to indicate some of the basic principles upon which a good full denture service may be provided and the simplest way of achieving it.

EXAMINATION OF THE PATIENT

A large proportion of the population is not interested in keeping the natural teeth, but this does not absolve us from trying to persuade all of them that it is necessary, and in certain cases where a malocclusion is present, or the jaw relationship is unfavourable, we should be prepared to go even further and refuse to treat the patient if our advice is not accepted.

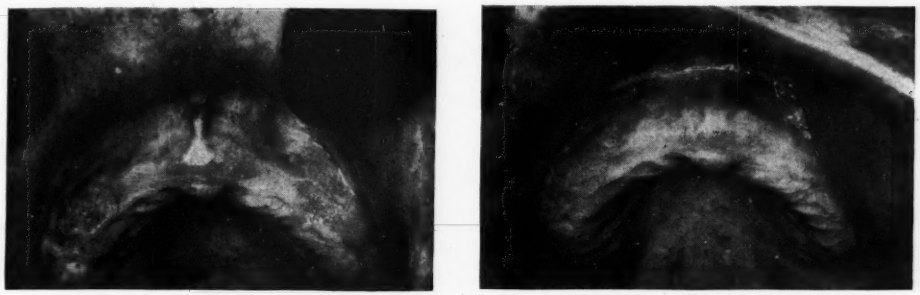
Many of the most difficult full denture cases could be prevented by taking a more positive attitude to the patient and insisting that he or she should keep some, or all, of the natural teeth. Who can say how rapidly the alveolar bone will resorb, leaving no ridge upon which to place a denture? The patient seldom realizes what will happen when his teeth are extracted, and because his relatives are satisfied with artificial teeth it is no guarantee that he will be so fortunate, and retention of some of the natural teeth—particularly $\overline{543}|\overline{345}$ in the lower will help to maintain the ridge and also help the patient to become accustomed to wearing a denture. It must be remembered that the periodontal membrane exerts a tensile force on the bone which is a more favourable one than the compressive force exerted by a denture. The periodontal membrane is also approximately three times the area of the mucous membrane remaining after the extraction of the teeth. (Watt, McGregor, Geddes, Cockburn, and Boyd, 1958.)

Where the patient is already in possession of full dentures it is advisable to try to get the patient to leave out the dentures for a day or so prior to taking final impressions, and so avoid making a denture to fit distorted tissue. In examining a patient consideration of those dentures in the patient's possession are essential, particularly so if he or she is dissatisfied with them. Unless a dentist has a clear idea of what is wrong and how he can alter them, it is a waste of time his remaking them, as his next set may give rise to exactly the same complaints. Many of the referred patients have three or four sets of teeth exactly alike, which suggests that the dentist has remade them with only Hope as his guide.

EXTRACTION OF THE TEETH AND PREPARATION OF THE MOUTH

The need for careful extraction with smoothing of the bone margins cannot be emphasized too strongly, particularly in those patients where periodontal disease has made the bone irregular and uneven. If this is combined with extractions at irregular intervals the resultant ridge upon which the prosthesis will rest will be in its most unfavourable form, which frequently leads to a typical sore mouth often seen in the $\overline{3}|\overline{3}$ region. The method of extraction also affects the ridge form, and it would appear that extraction of the teeth with forceps ultimately results in a better ridge than when the teeth are extracted by surgical means. The big problem in prosthetics is lack of cortical bone upon which to support the denture, and careful preservation of the buccal plate will help the dentist to arrive at a satisfactory result.

Being conservative in respect to removal of bone is, in my opinion, a very good thing, but the converse may be said of soft tissue. The dentist who hopes to make a denture around frænal attachments which start on the top of the ridge is courting failure, and since they are exceedingly simple to dissect out, they should be removed when the teeth are extracted or on insertion of the denture. Only by so doing will an adequate peripheral seal be achieved. (*Fig.* 1.)



A B

Fig. 1.—Before (A) and after (B) removal of frænum.

Other soft-tissue abnormalities like hyperplasias, flabby tissues, and pendulous tuberosities may also be removed, depending on the age and condition of the patient, but they are more difficult than the frænectomy and are perhaps best done by a specialist. In really difficult prosthetic cases it may be necessary to carry out more radical surgery such as mylohyoid ridge removal or separation of the mentalis muscles from their attachments to the mandible.

It must be emphasized that any such surgical treatment must always be done either by the prosthetist or by close co-operation between prosthetist and oral surgeon, or the end-result may make the foundation worse rather than better.

IMPRESSIONS

The aim of an impression is to obtain a negative likeness of the tissues, and whilst in the past great arguments have been advanced for specialized techniques, such as compression and non-compression of the mucosa, at the present time most impression techniques are of the non-compressive type principally because of the ease with which they can be taken. In addition little proof exists, other than clinical opinion, that there is a difference in the results over a period of years. Any difference in the casts of a patient, using both techniques, may be so small that the subsequent changes in curing and possible changes in soft-tissue outline (Lytle, 1957) may be of greater significance. We can therefore summarize what we require in a full denture impression: (1) Maximum tissue coverage; (2) Muscle trimmed periphery; (3) A simple static technique.

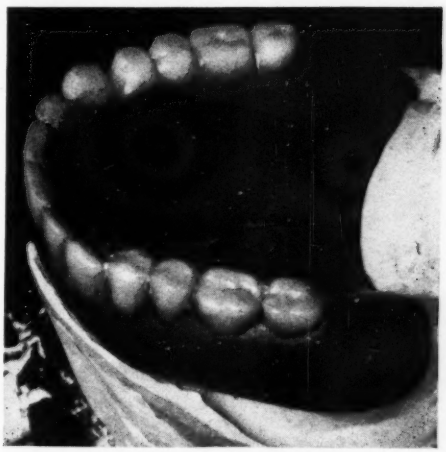


Fig. 2.—Denture placed on new cast to show underextension of the original denture.

Maximum Tissue Coverage.—It has been found in the majority of patients who have

been referred to this hospital for an opinion, that the dentures are underextended (*see also* Lawson, 1959). This particularly applies to the upper tuberosity region (*Fig.* 2) and over the whole of the lower denture. It is common practice by some technicians to underextend dentures under the misguided opinion that by so doing easings are rendered less likely. Quite the contrary, however, occurs—the bigger the denture base the less is the pressure per unit area of bone surface and therefore there are reduced possibilities of resorption, soreness, and pain.

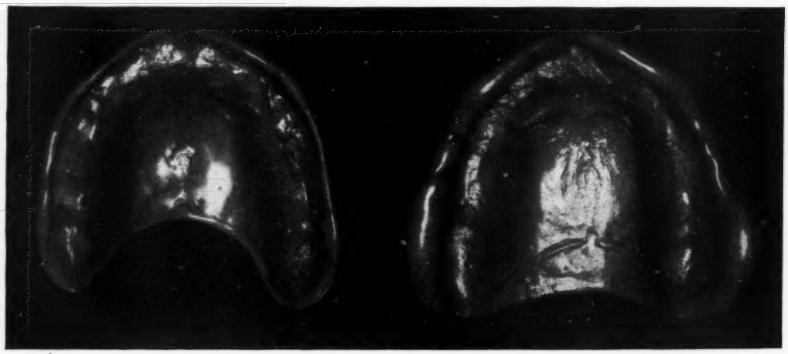


Fig. 3.—Dentures made for the same patient. *Left*, inadequate and, *right*, correct thickness of the periphery.

Fig. 4.—The complete periphery has been retained on this cast in order that the final denture will have the same extension and thickness that was produced in the impression.

Muscle Trimmed Periphery.—The exact periphery is subject to some speculation, since the extent will depend upon the consistency of the impression material and the technique employed, but the difference between the techniques should be relatively small. Apart from this point, however, most dentures examined do not show adequate thickness at the periphery. The seal obtained is due not only to the extent but also to the thickness, and therefore the amount depends on the degree of resorption and the general looseness of the soft tissues adjacent to the periphery (*Fig.* 3). Once the correct thickness and extension is obtained it *must* be maintained on the final denture, and therefore technicians should cast all models with the periphery enclosed in stone (*Fig.* 4) and, furthermore, the periphery should not be touched by stones or sandpaper after processing.

Technique—Simple Static.—The impression must be achieved in the minimum time and therefore as much should be done in the laboratory as possible. Plaster wash techniques with waste of chairside time in tray preparation are, in my opinion, not ideal. Preliminary overextended impressions of compound are the best, since they are quickly carried out and do not take more than 5–10 minutes, but it must be emphasized that these impressions must be such that really accurate final trays can be made upon the casts or the special trays may be worse than stock trays.

Some peripheral trimming of the tray is always advisable and therefore a special tray

of acrylic resin or polyester material (Watt, McGregor, and Geddes, 1958) is the ideal. Other materials may be used but distort when the edges are flamed. A space for the impression material must be provided and is easily accomplished using one thickness of base-plate wax over the preliminary cast. "Stops" made of wax $\frac{1}{8}$ in. thick and $\frac{1}{4} \times \frac{1}{2}$ in. should also be inserted in the laboratory in four places in the tray to avoid any tissue compression by the tray.

Personally the writer uses "Traybase"* trays with a periphery traced in "Paribar", as a good tracing compound is not readily available in this country. The procedure is not complicated or very time-consuming provided the tray has been made to the correct outline based on anatomical features.

Depending on the contours of the ridge and preference of the operator, the final impression can be taken in plaster or alginate. Personally the alginate is preferred since it is quicker, i.e. no pieces have to be fitted together at the chairside; patients find it more pleasant; it is easier to control, particularly in the lower, provided the tray has been adequately prepared; and it has a very long shelf life and is therefore consistent. It is accurate, provided it is adequately supported by the tray, and is displaced by the patient blowing air under the periphery. The impression when completed should show the tracing material all around the edge of the impression.

Alginate requires more care in handling and casting than plaster, and gives rather too good a reproduction of surface detail and consequently the dentures may have a rough tissue surface. This will require either a tin foiling of the model or the material may be removed, before insertion, by stoning and polishing. It is felt that the impression stage is very important because bad impressions lead to unnecessary easings, which, besides being uneconomical, are annoying to patient and surgeon alike.

REGISTRATION OF CENTRIC RELATION

This is perhaps the most difficult part of full denture construction, and it is therefore not surprising that there are errors in the centric relations of large numbers of full dentures. Allowing for the fact that there is some variation between dental surgeons in recording the centric relation, quite a large number of dentures seen exhibit gross errors which must have been due to faulty technique.

The most common error of technique is to use wax bases for the bite-blocks which are sure to distort when placed in the mouth or during the softening of the wax rim. Well-fitting shellac bases, with wax occlusal rims, which are stable and retentive, are essential and any registration with the occlusal rims riding around the mouth is certain to be wrong. In difficult cases the author has the base-plates lined with a zinc-oxide–eugenol paste in the laboratory, using the final cast, as this helps in getting better adaptation and more stable and retentive bases.

The method used for recording the centric jaw relationship is the one described by Swenson (1947). It is simple and provided the soft wax on the posterior segments of the lower rim is of equal thickness and consistency, any errors arising out of tissue compression will be minimal. If the rims are then chilled, the registration may be checked by reinserting the rims and getting the patient to tap them together as rapidly as possible whilst the operator observes that the wax projections on the lower fit accurately into the notches of the upper.

The use of very soft bite waxes which are sold by the dental supply depots is to be deplored as they are never hard, even at room temperature, and can be distorted by manipulation in the laboratory. A wax which is capable of being softened easily, but will be brittle and hard at mouth temperature, is essential.

Some operators attempt to seal the hard rims together in the mouth without closing into soft wax. This is liable to lead to errors owing to uneven tissue compression, and ultimately the teeth on the dentures will contact on one side only. It is also time consuming in attempting to get the rims to meet evenly.

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SETTING UP THE TEETH

In this respect several points should be emphasized. First the selection of anterior teeth and their position in relation to the ridge is often such that the balance of the patient's face is completely incorrect. Ideally the teeth should be placed where the natural teeth had been, and since labial resorption has taken place, this means that they are anterior to the ridge. Owing to this the size of the teeth must be adequate to fill the necessary space, and in spite of the patient saying "I had small teeth" the size must be commensurate with the face size.

Whilst it has been taught in the past that the lower teeth must be placed over the ridge, second thoughts on this issue by many prosthetists suggest that the more logical position would be in the "neutral zone" which is not related to the ridge. This zone is conceived as a position where the muscles of the cheeks, lips, and tongue counterbalance each other to maintain the denture as stable as possible (Fish, 1952).

In the past the positioning of the teeth in this space had been left arbitrarily to the technician, but recently two techniques have been described where this is incorporated in the impression (Matthews, 1958; Russell, 1959). Whilst these are an advance on previous techniques they are time consuming and can only be advocated in cases where previous difficulty has been experienced.

The selection of the tooth material is controversial, but in certain cases where the denture space is small, acrylic teeth may be used; their rapid wear, however, is such as to make their use in all cases contra-indicated. It has been said that as resorption takes place the balanced occlusion is maintained and no ridge damage results. This, however, is not so, since the teeth do not all wear to the same extent in eating and a malocclusion results often with an increased overbite which may lead to a midline fracture (Franks, 1959).

The ideal method of obtaining the desired balanced articulation is open to some discussion; my personal preference is a simple movable articulator such as the Freeplace or Gysi Simplex and a 20° cusped porcelain tooth. Re-registration of centric relation one week after insertion, using a wax wafer, is very enlightening. What appears a perfect occlusion can be shown to have premature contacts, and the author cannot stress enough the need for such a re-registration and re-mounting on an articulator with any necessary grinding. In my opinion it is often impossible in the mouth to get the patient to mark such premature contacts with articulating paper when the surface is as polished as glazed porcelain. Final milling in with carborundum paste in the mouth by the patient is to be recommended with all methods. The method of setting up and the type of teeth used also influence the technique required.

POST INSERTION INSTRUCTIONS

Far too many patients are under the impression that dentures should be worn night and day, and that they will last a lifetime, and this can only be due to the fact that they are not given adequate instruction when the dentures are inserted. They should be instructed to wear the dentures for about two weeks night and day until they are used to them, but after that period to leave them out when they are sleeping. They should be warned about soreness and given an appointment to return for selective grinding after one week. After this the patient should be told that the dentures are not intended to last a lifetime and that in five years the position should be reviewed.

Acknowledgement.—My thanks are due to Dr. Ollerenshaw, of the Department of Medical Illustration, Manchester Royal Infirmary, for the photographs.

REFERENCES

FISH, E. (1952), *Principles of Full Denture Prosthesis*, 5th ed. London: Staples Press.
FRANKS, A. S. T. (1959), *Proc. Brit. Soc. prosth. Dent.*
LAWSON, W. (1959), *Ibid.*
LYTLE, R. B. (1957), *J. pros. Dent.*, **7**, 27.
MATTHEWS, E. (1958), personal communication.
RUSSELL, A. F. (1959), *J. pros. Dent.*, **9**, 180.
SWENSON, M. G. (1947), *Complete Dentures*, 2nd ed., 368. St. Louis: C. V. Mosby & Co.
WATT, D. M., MCGREGOR, A. R., and GEDDES, M. (1958), *Brit. dent. J.*, **105**, 292.
— — — — — — COCKBURN, A., and BOYD, J. L. (1958), *Dent. Practit.*, **9**, 2.

STUDIES ON THE DEVELOPMENT OF THE PERIODONTAL MEMBRANE

THE PRINCIPAL FIBRES OF THE MOLAR TEETH

By **J. D. ECCLES, F.D.S., R.C.S. (Eng.)**
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INTRODUCTION

THE structure of the fully developed periodontal membrane has been adequately described, but our understanding of the process of its development is not so clear.

Fig. 1.—Periodontal space near apex of molar root showing unorientated and irregularly shaped fibroblasts with little collagen fibre formation. (× 420.)

Fig. 2.—Immediately adjacent area of same section, further from apex, showing elongated and obliquely orientated fibroblasts with collagen fibres forming around them and running in the same axis. (× 420.)

This investigation was carried out with the object of attempting to fill some part of this gap in our knowledge. The subject is also of interest because of its close relation to the problem of tooth eruption.

LITERATURE

Tomes (1923) and Mummery (1924) give little attention to this question, although detailed descriptions are given of the structure of the periodontal membrane and of the means of attachment of its fibres to bone and cementum. Orban (1957) states that the periodontal membrane is derived from the dental follicle and continues: "Around the tooth germ three zones can be seen: an outer zone containing fibres related to the bone; an inner zone of fibres adjacent to the tooth; and an intermediate zone of unorientated fibres between the other two. During the formation of cementum, fibres of the inner zone are attached to the surface of the root. As the tooth moves towards the oral cavity a gradual functional orientation of fibres takes place. Instead of loose and irregularly arranged fibres, fibre bundles extend from the bone to the tooth. . . . Although the bundles run directly from bone to cementum the single fibres do not span the entire distance. The bundles are 'spliced' together from shorter fibres in an intermediate plexus midway between cementum and bone."

No description is given of how the fibres first develop.

MATERIALS AND METHODS

The albino rat was selected for this investigation because specimens were readily available and because the molar teeth resemble human teeth fairly closely. Specimens were obtained aged from 10 days to 37 days, covering the period from beginning of root formation of the first molar until near its completion. In each specimen the periodontal membrane could be seen at different stages of development in different regions. Specimens were fixed in Bouin's solution or in formol saline; decalcified in 5 per cent trichloracetic acid or 5 per cent formic acid and sectioned. The stains used were Mallory's connective tissue stain, Gomori's stain for reticulin fibres, and hæmatoxylin and eosin to illustrate cell structure and bone formation.

Fig. 3.—Thick wavy bundles of collagen fibres running into bone as Sharpey's fibres. Osteoblasts lie between the bundles. (× 720.)

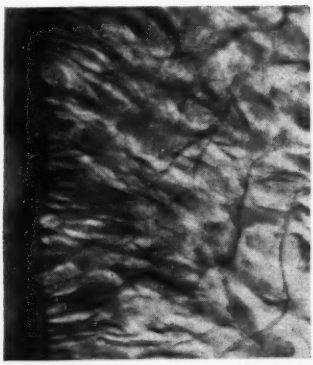


Fig. 4.—Fine, closely-packed bundles of collagen fibres attached to cementum. (× 720.)

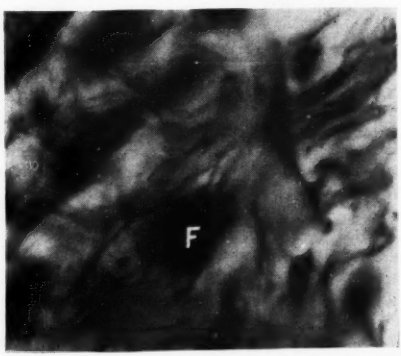


Fig. 5.—Continuation of bundles shown in *Fig.* 3. Individual fibres are being formed and will later be aggregated to form an extension of the existing bundles. F, Fibroblast. (× 720.)

FINDINGS

Fibrogenesis.—Before root formation begins, the tooth germ is surrounded by loose connective tissue—the dental follicle. This tissue is continuous at the mouth of the bony crypt with the submucosa which attaches the oral epithelium to the underlying bone. Soon after root formation begins, fibroblasts begin to differentiate and increase in number in the follicle alongside the root (*Fig.* 1). Around the developing end of the root loose connective tissue remains. These fibroblasts are at first irregular in shape and haphazard in arrangement but soon become elongated and orientated along an axis which runs from bone to tooth most commonly with an obliquity towards the apex. At the same time numbers of collagen fibres begin to appear between the fibroblasts, running in the same axis (*Fig.* 2).

Collagen fibres form the organic matrix of bone and cementum; and the next stage in development of the periodontal membrane is the formation of fibres, which are continuous with the fibres of bone and cementum on either side, and which become aggregated into bundles. During this first phase the bundles

on the alveolar side are thicker than those from the cementum. *Fig.* 3 shows the developing bundles, separated by large spaces in which osteoblasts lie near the surface of the bone. The fibres can be seen running into the bone as Sharpey's fibres. On the cementum side

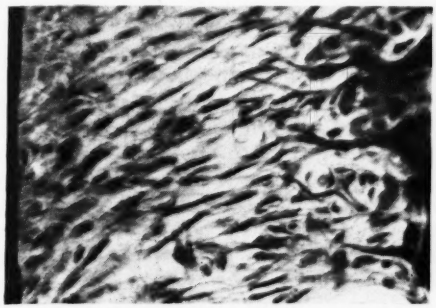


Fig. 6.—Thick collagen fibre bundles extend from bone, their free ends "unravelled". Note elongated and orientated fibroblasts. (× 387.)

(*Fig.* 4) it is seen that the bundles are less dense and have smaller intervals between them. A thin layer of cementum, with occasional cementoblasts, can be seen. The

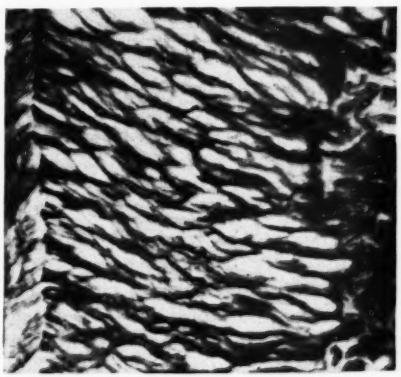


Fig. 8.—After active eruption has ceased the bundles do appear to run directly from bone to tooth. (× 360.)

cells are seen to lie among the fibres rather than in definite spaces.

Fig. 5 is a continuation of the field adjacent to *Fig.* 3 and shows a zone in the middle of the periodontal space in which fibre formation is actively progressing. The fibres, however, are not yet orientated into bundles. At F is a fibroblast which appears to be in the process of

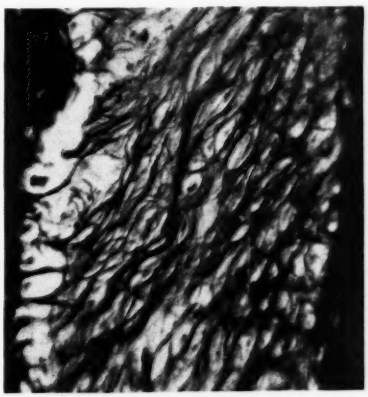


Fig. 7.—During active eruption bundles do not run continuously from bone to tooth but the unravelled ends of alveolar and dental fibres intermingle in the centre of the periodontal membrane. (× 320.)

Fig. 9.—Periodontal fibre development takes place first on the surfaces of the roots facing outwards; later on the inwards-facing surfaces, and only to a small extent in the bifurcation. (× 38.)

forming a number of fibres. It is believed (Stearns, 1940 a, b) that fibre formation takes place extra-cellularly on or near the surface of the fibroblast. These newly-formed fibres appear to become incorporated in the fibre

bundles so that the fibre bundles appear to "grow" across the periodontal space. At this stage, however, the free ends of the bundles arising from both the bone and cementum appear to be "unravelled" (*Fig.* 6).

The bundles from the alveolar side advance more rapidly into the periodontal space than those from the cementum and cover two-thirds of its width when the two sets of bundles meet. This first takes place four or five days before the teeth erupt through the oral mucosa.

Careful examination shows that the fibre bundles from each side do not join at this stage but their "unravelled" ends intermingle. No bundle or fibre runs directly from bone to tooth (*Fig.* 7).

There is at no stage in development a well-defined intermediate plexus in the rat molar, such as is present in the incisor, but the zone at which the fibres meet can be considered as corresponding to this plexus in its functional significance.

In the adult rat thick fibre bundles run directly from bone to tooth. Small groups of fibres often branch from one bundle and join another adjacent bundle (*Fig.* 8).

Fig. 9 shows that the formation of the periodontal membrane takes place first and more densely on the outwards-facing surfaces of the roots and later on the inwards-facing surfaces, and much later and to a lesser extent in the region at the bifurcation of the roots.

DISCUSSION

Functional Orientation.—Orban states that the fibres of the periodontal membrane become functionally orientated, and Sicher (1949) also stresses the part of function in the arrangement of the periodontal fibres.

Weiss (1939) showed that if a film of embryonic connective tissue cells, grown in tissue culture, is subjected to regional tension, the cells exposed to the tensile force multiply more rapidly and orientate themselves in parallel lines in the direction of the stress. "In fact, the entire texture of the newly formed tissue varied with the local pattern of stress", he says. The tension acts not directly on the cells but on the ultra-microscopic structure of the surrounding colloidal medium, and through it, on the cells.

Stearns (1940 a, b) observed over a period of days the invasion by fibroblasts of transparent chambers inserted into rabbit's ears and concluded that the heaviest formation of fibres occurred around the chambers where the tissue was directly affected by the tension produced. The fibres were laid down parallel to and between the fibroblasts.

In this investigation it has been shown that orientation of fibroblasts and fibre formation began before the tooth erupted through the gum. During this period, however, the erupting tooth is already under functional stress through the pressures exerted on the overlying gum. As the crown of the tooth rises above the level of the alveolar margin, the tension upon the developing periodontal membrane increases and the fibre bundles become stronger and denser. The direction of their axis of development corresponds to the direction of the stress.

Fig. 9 shows that the areas where fibre bundle formation takes place earliest are those in which the tensile stress would be expected to be greatest, that is, between the outward-facing root surfaces and the adjacent alveolus. Between the inward-facing root surfaces and the related inter-radicular septa, the density of bundle formation is less because less stress is probably exerted in this region. In the bifurcation where little tensile stress would be expected there is little bundle formation.

Adaptation of the Periodontal Fibres during Eruption.—It is widely believed that the adaptation of the periodontal fibres, which is necessary during eruption as the tooth moves in relation to the bone, takes place in the intermediate plexus (Weinmann, 1955). This plexus is believed to be present in all mammalian teeth, being conspicuous or inconspicuous according to the rate of eruptive movements (Orban, 1957). Orban implies that this is present during the whole of the functional life of the tooth, being observable during the period of comparatively rapid movement of active eruption and "quite inconspicuous" during the functional period

when eruptive movements and mesial drift are very slow.

Orban (1958) now believes that "no single fibre bundle extends from cementum directly to alveolar bone", in contrast to his previous view that the bundles did run the whole way across and that it was only the constituent fibres which were interrupted.

The present investigation would seem to indicate that during the period of active eruption the bundles commence to develop from both the bone and cementum attachments, and their free ends intermingle in the intermediate plexus, so that at this stage the fibre bundles do not run directly from bone to tooth.

After active eruption is complete the bundles appear to run directly from bone to tooth and no intermediate plexus can be seen. Fibres often branch from one bundle and join another adjacent bundle. During this functional period in the rat molar, only very slow eruptive movements occur, and it is suggested that the adaptation necessary for these is obtained by gradual migration of small groups of fibres from one bundle to another.

It was not clear in the molar teeth exactly how the two sets of fibres were associated in the intermediate plexus. It seems probable that the well-defined intermediate plexus which develops in relation to the continuously erupting rat incisor may offer better scope for the study of this aspect of the problem.

SUMMARY

The development of the principal fibres of the periodontal membrane of the molar of the albino rat is described.

Support is given to the theory that function plays an important part in stimulating development and orientation of the fibre bundles of the periodontal membrane.

No well-defined permanent intermediate plexus exists in the rat molar, but an intermediate plexus exists during the period of active eruption in which, during eruption, adaptation takes place between the fibre bundles attached to bone and those attached to tooth. After completion of active eruption the fibre bundles run continuously from tooth to bone.

Acknowledgements.—I wish to thank Dr. James Scott for much guidance and helpful advice, Mr. S. McKearney for technical assistance, and Mr. G. Bryan for taking the photomicrographs.

REFERENCES

MUMMERY, J. H. (1924), *The Microscopic and General Anatomy of the Teeth*, 2nd ed. London: Oxford University Press.

ORBAN, B. (1957), *Oral Histology and Embryology*, 4th ed. London: Kimpton.

— — (1958), *Periodontics—a Concept Theory and Practice*. London: Kimpton.

SICHER, H. (1949), *Oral Anatomy*. St. Louis: Mosby.

STEARNS, M. L. (1940 a), *Amer. J. Anat.*, **66**, 133.

— — (1940 b), *Ibid.*, **67**, 55.

TOMES, C. S. (1923), *A Manual of Dental Anatomy*, 8th ed. London: Churchill.

WEINMANN, J. P. (1955), *Oral Surg.*, **8**, 977.

WEISS, P. (1939), *Principles of Development*. New York: Holt.

Determination of Local Anæsthetic Efficiency

Using a hæmophysiological method, a study of the four parameters of local anæsthesia was made. These were: (1) Onset; (2) Onset of complete anæsthesia; (3) Initial return of nerve activity; (4) Complete return of nerve activity.

The tests were made on 27 rats by insertion of recording electrodes into the left gasserian ganglion and two stimulating needle electrodes into the left maxillary canine gossar. Alterations in action potential of the nerve were recorded on a quantitative and qualitative basis. Procaine hydrochloride and lidocaine hydrochloride were compared in 1 and 2 per cent solutions in doses of 2, 4 and 8 minims.

Onset of anæsthesia was hastened with an increase of volume of solution injected. Amongst other findings was the fact that 1 per cent lidocaine hydrochloride was more efficient than 2 per cent procaine hydrochloride.—PETROS, G. J., and GIBILESCO, J. A. (1959), *J. dent. Res.*, **38**, 348.

LOCAL ANÆSTHESIA OF THE MANDIBULAR MOLAR TEETH—A NEW TECHNIQUE

By **J. CLARKE**, L.D.S., and **G. HOLMES**, M.B., Ch.B.
Departments of Anatomy and Dental Surgery, University of Sheffield

IT is a common experience to find that the lower molar teeth remain sensitive after an inferior dental nerve block. Various workers have attempted to explain this phenomenon.

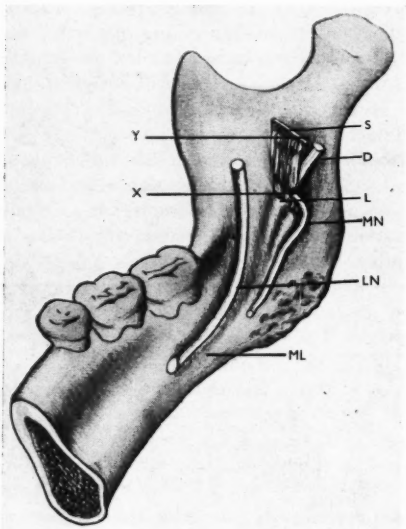


Fig. 1.—The relationship of the nerves to the ramus of the mandible. Note that at the mandibular foramen the anterior part of the nerve is covered by the sphenomandibular ligament. X marks the site at which the injection is normally given at the mandibular foramen; Y marks the position of the tip of the needle in the new technique; D, Inferior dental nerve; L, Lingula; LN, Lingual nerve; ML, Mylohyoid line; MN, Mylohyoid nerve; S, Sphenomandibular ligament.

Stewart and Wilson (1928) claimed that the pulps of the posterior mandibular teeth are innervated from the lingual and buccal nerves. After carefully blocking the inferior dental nerve at the mandibular foramen, they found that the molar pulps remained sensitive, becoming anæsthetized only after buccal and lingual blocks were completed. In a subsequent paper Starkie and Stewart (1931) stated that the posterior mandibular teeth are innervated through an "internal alveolar plexus", but they mentioned no communication from the lingual or buccal nerves to this plexus.

Other authors have suggested that the cervical plexus contributes to the innervation of the teeth, but this seems unlikely on theoretical and embryological grounds. The great auricular nerve, however, which supplies the skin over the parotid gland and the angle of the jaw, might well supply the alveolar periosteum. Marshall (quoted by Widdowson, 1952) found that the buccal aspect of the gums in the region of the molar teeth remained sensitive after resection of the sensory root of the trigeminal nerve.

ANATOMY OF THE INFERIOR DENTAL NERVE

As the inferior dental nerve passes up from its foramen it is closely related to the mandible for about one quarter of an inch and is here kept applied to the ascending mandibular ramus by the lingula and sphenomandibular ligament. Thereafter, as the sensory fibres ascend to the foramen ovale, they become separated from the mandible by the depth of a sulcus which lies behind the internal oblique line which is the upward continuation of the mylohyoid line (*Fig.* 1).

Most techniques for the inferior dental nerve block attempt to place the anæsthetic fluid behind the mandibular foramen, which lies one finger's thickness above the occlusal plane of the molar teeth. At this level the anterior part of the nerve is concealed by the lingula and the sphenomandibular ligament. Local anæsthetic solution so placed would diffuse less readily to these well protected anterior fibres, and this suggests that the sensory fibres in the inferior dental nerve which supply the molar teeth probably occupy the most anterior part of the nerve.

Sicher (1946) states that the nerve from the wisdom tooth occasionally joins the main nerve trunk above the mandibular foramen, leaving the bone by its own foramen more anteriorly; thus in order to anæsthetize this branch, some anæsthetic should be injected at a slightly higher level.

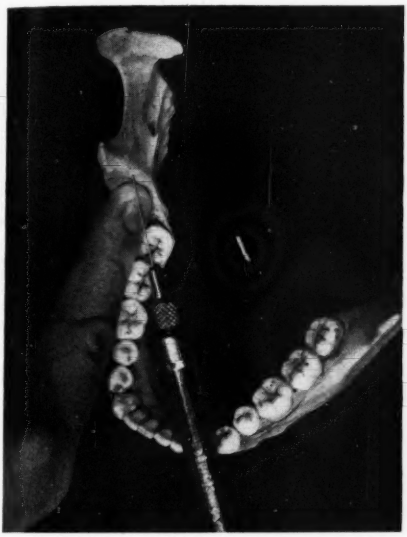


Fig. 2.—Position of the needle in the first position before the injection is made.

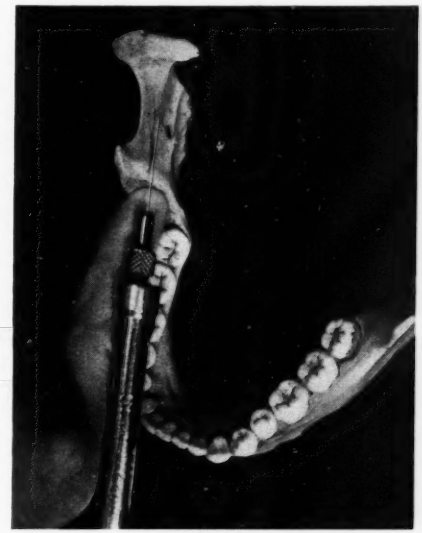


Fig. 3.—Position of the needle at the site of the injection.

METHOD AND RESULTS

Modified Indirect Method.—The patient is instructed to keep the mouth wide open, and the head-rest is adjusted so that the mandibular molar occlusal plane is parallel to the floor. Slide the finger along the molar teeth in order to palpate the external oblique line of the mandible. Rotate the finger towards the thumb side so that the tip of the finger now lies in the retromolar fossa, and the finger-nail is superimposed upon the internal oblique line.

The loaded syringe with a $1\frac{5}{8}$-in. needle is taken, and advancing from between the bicuspids on the opposite side, the point of the needle is made to pierce the mucous membrane just above the finger-nail and not at the mid-point of the finger-nail as in previous methods.

The internal oblique line is now encountered, and the syringe is moved gently round until the barrel of the syringe lies over the central incisors of the mandible, at the same time keeping it parallel to the molar teeth in a horizontal plane.

Allow the needle to penetrate deeper, approximately another $\frac{3}{4}$ in., and slowly deposit $1\frac{1}{2}$ c.c. of the local anæsthetic solution.

Thus the injection will have been made half an inch higher than the usual site and in the vicinity of the nerve where it lies free of the bone.

As the syringe is being withdrawn, the remainder of the anæsthetic fluid is slowly injected all the way out, and this will anæsthetize the lingual nerve.

In order to compare this technique with the standard procedure, 40 healthy young adults were selected at random from patients attending the Conservation Clinic, and divided into two equal groups.

"Hostacaine special" anæsthetic was used throughout, each patient receiving $1\frac{1}{2}$ c.c.,

and all the injections were given by the same operator (J. C.). One group received the injection at the higher level, and the control group received the traditional inferior dental, lingual, and long buccal injections at the usual sites. After an interval of five minutes the teeth were tested with an electrical pulp stimulator.

In the control group, in 14 cases, the molar teeth were completely anæsthetized, but in the remaining 6 patients, one or more of the molar teeth remained sensitive to electrical stimulation.

In all 20 cases receiving the higher injection, the molar teeth were insensitive to the pulp tester

Thus in the small series studied, the higher injection was more effective in anæsthetizing the molar teeth than was the standard inferior dental block. Furthermore, the impression gained was that the patients suffered less post-operative pain from this technique, possibly because the tissues into which the injection is made at the higher level are less tense than at the mandibular foramen.

The danger of intravascular injection, either into the pterygoid venous plexus or the maxillary artery, appears to be no greater than in any other blind injection for regional dental anæsthesia.

There were no complications in this series.

SUMMARY

1. A new technique for anæsthetizing the lower molar teeth is described.

2. The anatomical basis of the injection is discussed.

3. In the series studied, the method was more effective than the standard procedure.

Acknowledgements.—The authors wish to express their thanks to Professor Francis Davies, Mr. E. L. Hampson, and Dr. B. F. Martin for advice and helpful criticism; also to Mr. R. Coussins for the illustrations, and to Messrs. Horlicks Ltd. for making available the supplies of "Hostacaine special" anæsthetic solution.

REFERENCES

SICHER, H. (1946), *J. Amer. dent. Ass.*, **33**, 1551.
STARKIE, C., and STEWART, D. (1931), *J. Anat. Lond.*, **65**, 319.
STEWART, D., and WILSON, S. L. (1928), *Lancet*, **2**, 809.
WIDDOWSON, T. W. (1952), *Special or Dental Anatomy and Physiology and Dental Histology*, 8th ed., 244. London: Staples Press.

Malignant Giant-cell Tumour of the Mandible: Report of a Case

A 14-year-old boy received a blow on the right side of the mandible in August, 1956. Soreness developed in the lower right first molar region and this tooth was extracted. Two weeks later a pea-sized lump protruded from the extraction site. Two months later a biopsy was reported as "fibrous dysplasia". In February, 1957, excision was carried out down to the inferior dental canal. The report on this tissue was peripheral giant-cell tumour.

By May of that year a considerable recurrence had appeared with every evidence of bone involvement. As no other lesions were discovered and calcium metabolism appeared normal, excision with a wide margin was carried out. This tissue was again reported as moderately cellular peripheral giant-cell tumour. After a further recurrence had appeared two and a half weeks later a further biopsy was taken and the lesion irradiated with a dose of 1500 r. This failed to restrain the tumour.

Two further resections of the lesion, both apparently with an adequate margin, were carried out. The last excision of bone and soft tissues included the whole of the right mandible and the anterior part of the left as far as the mental foramen. The histological report on this specimen was of an osteoblastoma with reactive new bone formation. Regional lymph-nodes were free from growth, but tumour cells were seen in the vascular spaces.

Recurrence was again noted in September, 1957. By December the right infratemporal fossa was involved, and in January, 1958, metastases appeared in the lungs.—HAYWARD, JAMES R. (1959), *J. oral Surg.*, **17**, 75.

ELIMINATING THE GUESSWORK, UNCERTAINTY, AND WORRY IN THE MIXING OF DENTAL CEMENTS*

By K. PAUL RAMSAY, D.D.S., L.D.S. R.C.S. (Eng.)

THERE are several "variables" which profoundly affect our dental cements. These are Room Temperature, Slab Temperature, Dew-point, Relative Humidity Percentage, and Liquid Deterioration. It is possible to control some of these factors, such as the temperature of the slab, but since other factors vary from day to day and from hour to hour, having a fixed slab temperature is fallacious reasoning and utterly unscientific because the temperature of the slab *must* fluctuate in conjunction with the fluctuation of the other variables.

If, let us assume, the slab has been chilled to a temperature of 55° F. (by cold water or by placing in the refrigerator, as is done frequently), then, if the dew-point is above that slab temperature, moisture will condense on the slab, even if not readily observed, and this moisture will be incorporated into the cement, accelerating the set.

Relative humidity percentage varies constantly and cannot be controlled at all in our surgeries, even with the most superb air conditioning and humidity control systems available.

Dew-point is one variable we are not able to control at any time. It fluctuates up and down at Nature's pleasure, and these fluctuations are governed by the room temperature and relative humidity percentage. To repeat myself—if we chill our slab even 1° too cold, and reach the dew-point or below, you will understand that we are in for a lot of trouble because of the condensation of moisture on the chilled slab.

Another variable is the liquid, which factor becomes of great importance the moment we break the seal of the bottle and the liquid is exposed to the air. The liquid is a phosphoric acid–water solution and very hygroscopic. Either the moisture in the liquid evaporates or the phosphoric acid attracts additional moisture upon exposure to the air, depending upon atmospheric conditions. In either case the phosphoric acid–water balance of the liquid is destroyed. The more often the bottle is opened, or poorly sealed, and the longer the liquid is exposed to the air, the more it deteriorates, causing an imbalance of the correct phosphoric acid–water ratio. Changes in the liquid also follow the moment the liquid is placed on the slab and exposed to the air; therefore if the liquid is placed on the slab several minutes prior to mixing (often done) a poor cement is the result.

Some men will say that they use a definite quantity of powder to so many drops of liquid, but sizes of drops vary, and usually only an amount of powder which the operator *thinks* is producing the right consistency and set is incorporated with the measured liquid. Frequently some powder is left over, or occasionally a bit more is added, to produce what the operator guesses to be correct according to his experience.

The American Dental Association in its "Specifications for Dental Cements" has set up certain minimum standards and characteristics for dental cements. Two of the more important points are hardness and flow characteristics.

Maximum hardness is attained by allowing the cement to set in a normal manner after all the correctly proportioned powder and liquid is thoroughly incorporated together.

Flow characteristics are equally as important to the dentist who has carefully made his preparation and obtained his impression, then produced a casting which nowadays is remarkable for its accuracy of fit. How often has your heart ached at the sight of a cement margin or high occlusion *after* cementation? Therefore, flow is an important point, so your

* Paper and clinic presented at the Meeting of the American Dental Society of Europe, Stockholm, July 7–10, 1959.

castings can go to place, and the specifications of the A.D.A. are quite strict on this point, requiring a mix of the desired consistency using 0·5 c.c. of liquid. This 0·5 c.c. was an arbitrarily selected quantity of liquid for test purposes to achieve standardization. A weight of 120 g. is then placed over the mix and the resulting circle should not exceed 31 mm. or be less than 29 mm. in diameter within a specified setting time. This is where most cements fail. Should the resultant cement produce a circle having a diameter of only 24 mm., let us say, it means that the flow characteristic has been cut down and a heavy film of cement results in failure to seat our castings completely.

Kile's solution (1935, 1936) of these problems stems from the same experiences in setting castings and pontics that we all have had—except that, recognizing the variables and inconsistencies attending our mixing procedure, he did something about it. He studied the variables and kept accurate recordings hour by hour, day by day, and month by month, until he had a pattern, with its problems, which he then proceeded to solve.

The liquid problem was solved by designing a syringe which keeps the liquid in a sealed cartridge-like container, so that the only time the liquid is exposed to the air is the few seconds required to eject the fluid on to the slab. A measuring device is incorporated on the plunger which permits only an exactly measured quantity of 0·25 c.c. of liquid to be ejected on to the slab. The instrument is calibrated to deliver 0·25 c.c. of liquid and the amount of powder is likewise cut in half, in order to conserve material for the user, but, of course, the ratio remains the same as the aforementioned quantity of liquid used in the A.D.A. tests. If a greater quantity is desired simply adjust the calibration to a like number of capsules.

The 0·25 c.c. of liquid (mentioned before) will be incorporated with an equally exactly measured quantity (by weight) of powder contained in a capsule, also emptied on to the slab at the time of mixing. The powder is therefore uncontaminated, which is not the case with the bottle method, where a large quantity of powder is dumped on the slab and a hit-or-miss method of gradually incorporating sufficient powder until one arrives at the consistency of the mix which one *thinks and hopes* is right—then the balance of the powder from the slab is put back in the bottle. The air is contaminating the powder, the spatula is contaminating the powder, and this contaminated powder is put back in the bottle, which in all probability has been left open all this time. Thus the powder in the bottle continues to deteriorate.

Now we have two controlled factors—a definite quantity by measure of uncontaminated liquid and a definite quantity by weight of uncontaminated powder. So let us return to the problems of defeating varying atmospheric conditions and room temperatures, bringing with them the concomitant problems of dew-point and condensation of moisture on the slab. Kile tried innumerable ways to overcome these difficulties and, as happens in other walks of life, finally hit on the idea of making these variables work for him. In other words, "If you can't beat them, join them". He got the atmospheric variables to establish the slab temperature above the dew-point and as cool as possible so as not to accelerate the set or cold enough to injure the pulp. The mixing surface has a black, baked, glazed surface for better visibility—to make certain all of the powder is incorporated into all of the liquid. The key to success, however, lies in the main body or undersurface of the slab. This is of a special baked clay, which is ribbed to increase the evaporating surfaces, and sufficiently porous to hold water. How does this work? Simple, when it is pointed out to us!

We keep the slab immersed in water at room temperature so that the porous baked clay is always saturated. Some minutes prior to use we remove the slab from the water, dry the black glazed mixing surface, and place the underneath or ribbed surface facing a small electric fan, or an open window, or anywhere that there is a good draught of air to accelerate evaporation of the moisture in the porous clay. This results in cooling the mixing surface. It is a physical impossibility for

Nature to cool this mixing surface below the dew-point, as I shall show you, and we have a variable slab temperature which is in harmony with all the variables we have mentioned. Instead of annoying or antagonizing these natural phenomena, they have been put to work to establish perfect harmony automatically. The slab must be washed after use, which replaces the water lost by evaporation. We keep ours in a jar of water at room temperature and it is always ready for use.

So now what do we have? The correct uncontaminated liquid-powder ratio and a slab with the problems of atmospheric conditions, room temperatures, relative humidity percentage, dew-point, etc., all controlled in perfect harmony with the variables.

We have arrived at the final problem—how to mix!

A moment's thought will bring to light the fact that when we bring into the liquid a small quantity of powder and incorporate same we have actually started the chemical combination of the two. We then bring in another quantity of powder and do the same, and continue bringing in and incorporating powder until we arrive at *what we think or guess* is the required consistency of the mix. Isn't it obvious that our first batch of incorporated powder will be "ahead" of the second, the second "ahead" of the third, and so on, in completing the chemical reaction between the powder and the liquid? And following this thought, isn't it logical that the successive additions of powder are not being brought into our original phosphoric acid solution, but into a mixture of variable chemical reactions, all proceeding at different rates of speed, and that it is perfectly possible and conceivable that the "first mix" will have completed its reaction and be crystallizing before the last portion of powder has even been brought into this mixture of chemical reactions, each proceeding at different rates of speed? So then we wonder why we cannot seat our inlays, crowns, bridges, and pontics to place, and see that heart-breaking cement line when we were certain that our margins were perfect prior to cementation. We have developed precision castings, but to what avail if at the last moment all is ruined by our cementing media? To overcome this hazard some men put holes in crowns so they can try to get them seated. With properly mixed, homogeneous, smooth cement this is not necessary.

By this time you will have guessed the answer. *All of the powder is incorporated into all of the liquid at the same time.* There is but one reaction, instead of several, the correct powder-liquid ratio has been maintained, there is no moisture contamination, the consistency is always the same, day in and day out one knows where one stands in so far as the cement is concerned. There is no guesswork involved, no human, temperature, humidity, or dew-point variables to worry about.

For cement bases, the setting of orthodontic bands, etc., wherever a stiffer, heavier mix is desired, do not add more powder. Simply wait for the cement to set to the desired consistency, or hasten the set by merely removing the mixed cement, by means of the spatula, from the cold slab to another slab of room temperature or warmer. Do *not* alter the correct powder-liquid ratio by the addition of more powder.

Silicates obey the same laws, so the Kile slab is ideal for mixing, but because of the variable quantities of silicates used in varying circumstances the stabilization of a given quantity is impractical. Do not stir or mix silicates as one does the zinc oxyphosphate cements; rather roll or pat them, as one would "puddle" a mix.

I should like to make one comment before I conclude. These materials—the syringe, slab, liquid, and powder—are distributed and sold only by The Motloid Co.* through the dental supply houses. The liquid-powder ratio of this cement has been worked out independently in the research laboratories of the University of Michigan to meet the A.D.A. "Specification No. 8 for Dental Cements". Therefore these ratios apply only to this particular cement and to no other, so please

* The Motloid Company, 325 W. Huron St., Chicago 10, Ill., U.S.A.

do not get the bright idea of refilling the cartridge with some other liquid or the capsules with another powder—it just won't work!

CONCLUSION

The ultimate success of all fixed work in the mouth depends upon the chemically balanced mix of cement to seal the margins.

Today, precision castings are not produced by any guesswork method. All phases have been given the utmost attention from the impression to the final finished casting, with one exception—the proper mixing of dental cements. Therefore, why not complete this important phase of dentistry by also preparing the dental cement scientifically instead of using a guess method?

REFERENCES

KILE, C. S. (1935), "Zinc Phosphate Cements", *Dent. Dig.*, June; *Florida State Journal*, July, 1936.
— — (1936), "Variables Affecting Dental Cements, and Their Control", *Dent. Survey*, April.
— —, personal correspondence.
— —, personal correspondence with Mr. A. B. Pickards, the Motloid Co.
THE MOTLOID CO., various publications.

Periodontal Concepts of Theory and Practice

Three factors are considered; the local, the systemic, and the occlusal.

Under the local factor the periodontal pocket is caused by the apical proliferation of epithelial attachment and its subsequent detachment. Four facts are known about this:—

1. No known systemic disease can cause the epithelial attachments to migrate apically.
2. Occlusal traumatism *per se* cannot cause this migration.
3. The adjacent connective tissue fibres act as a barrier to migration.
4. Inflammation can cause the epithelium to proliferate and migrate, forming a true pocket.

Under the systemic factor the severity of the periodontal lesion depends upon the interaction between virulence of the local irritant, its duration, and host-resistance.

Occlusion is involved in three ways:—

1. Occlusion cannot initiate migration, but it can increase the severity of the lesion by further destroying supporting tissues once a pocket has been formed.
2. Occlusal forces causing tooth mobility can interfere with the healing process.
3. Excessive occlusal forces can destroy supporting structures without necessarily causing pocket formation.

What are the objectives of therapy? The objective of therapy is to establish a healthy periodontium both in form and function. This involves eradication of the lesion, correction of the deformity associated with it, and the elimination of the causes.

Therapy can be divided into:—

1. That which is directed towards the marginal area, for example, curettage, gingivectomy, gingivoplasty.
2. That which is directed towards the attachment apparatus as, for example, occlusal adjustments, orthodontics, temporary or permanent splinting.
3. Adjunctive procedures such as mucogingival surgery.

Treatment should also include oral physiotherapeutic measures to maintain oral health.

The rationale for the therapeutic procedures can be described as follows:—

1. Curettage removes both calcareous deposits and ulcerated sulcular epithelium.
2. If mobility of teeth is a prominent feature, stabilization is indicated, especially where bone or bone-like tissues are involved. Splinting is indicated where there are unfavourable crown–root ratios.
3. Plastic procedure, through elimination of remaining pockets and prevention of recurrence, consist of reshaping the teeth, reshaping of the soft tissues, reshaping underlying hard tissues, and home care.

What constitutes a successful treatment? The patient should be able to chew adequately, be pleased with the aesthetic result, have no disturbance to temporomandibular joints or to the supporting structures of the teeth.

Periodontitis can recur if calculus, food impaction, and poor oral hygiene are ignored. —BAER, P. N. (1959), *N. Y. St. dent. J.*, **25**, No. 1; *Oral Health*, **49**, No. 4.

ACUTE STREPTOCOCCAL GINGIVITIS*

By G. C. BLAKE, M.B., B.S., F.D.S., and J. R. TROTT,† B.D.S.
Departments of Pathology and Periodontology, Institute of Dental Surgery, Eastman Dental Hospital, London, W.C.1

INTRODUCTION

AUTHORS of text-books of oral surgery and periodontia have described acute streptococcal gingivitis, either under that name or as a gingivitis or gingivo-stomatitis of streptococcal origin. However, there is a sufficient lack of consistency in the descriptions, of the clinical appearances and the bacteriological findings, to raise some doubts as to the real nature of the condition.

The first description of streptococcal gingivitis or stomatitis was given by Mead in the fourth edition of his *Diseases of the Mouth* (1932). He describes it as sometimes following a streptococcal sore throat or a severe cold, and states that it usually begins as a gingivitis around two or three teeth, then spreading to involve the gingiva of both jaws. The gingiva is red, enlarged, congested, painful, and bleeds easily, but ulceration does not occur. Mead gives the bacteriological findings as mixed oral flora with *viridans* streptococci predominating and he makes no mention of hæmolytic streptococci. In his book Mead gives case histories of three patients suffering from this condition.

No other similar cases are reported in the periodical literature, although Mumford and Hepplestein (1943) described an epidemic of stomatitis and dermatitis probably due to hæmolytic streptococci. We therefore reviewed the descriptions of acute gingivitis due to streptococci which are given in recent editions of text-books by Burkett (1957), Thoma (1954), Stones (1954), Orban (1958), Glickman (1958), and Goldman and Cohen (1957). All these authors describe an acute diffuse inflammation of the gingiva, sometimes spreading to other parts of the mouth. Stones and Thoma stress the involvement of the gingival margin. There is general agreement that the gingiva is fiery or vivid red, painful, and bleeds easily. Orban, Stones, and

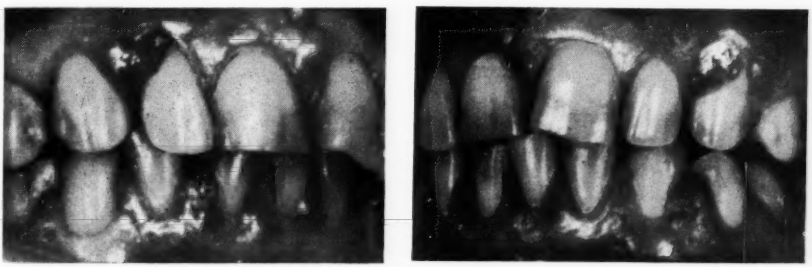


Fig. 1.—*Case* 1. Right and left anterior view, when first seen, showing enlargement of the gingiva with gingival abscesses present adjacent to $\underline{2}|$ and $|\underline{3}$.

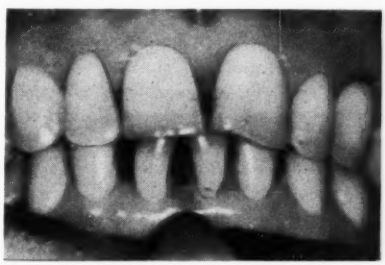


Fig. 2.—*Case* 1. Anterior view 2 weeks after completion of penicillin treatment.

* A Communication read to the British Society of Periodontology, March 9, 1959.

† Present address: Faculty of Dentistry, University of Manitoba, Winnipeg 3.

Burkett mention the possibility of gingival ulceration, and Burkett and Orban describe an association with upper respiratory infections. Most authors give the causative organisms as *viridans* streptococci, only Goldman and Thoma attributing the infection to hæmolytic streptococci.

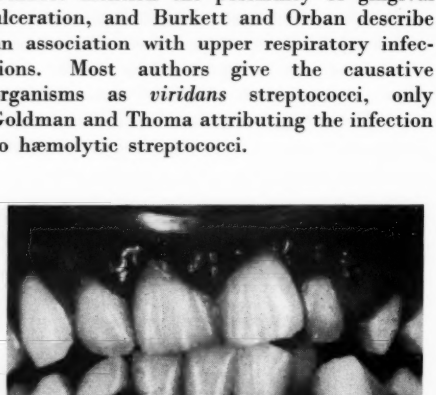


Fig. 3.—*Case* 2. Anterior view, when first seen, showing swelling of the gingiva with gingival abscesses adjacent to $\overline{2}|$ and $|\underline{2}$.

During the last eighteen months we have seen three cases which show similarities to those described by Mead. Two of them followed upon infection of the throat, and in all three the gingiva showed generalized diffuse, acute inflammation, with enlargement of the papillæ. However, all our patients developed gingival abscesses. From two patients, cultures predominantly of hæmolytic streptococci were obtained. All three had a raised total white cell count and a raised neutrophil count.

CASE REPORTS

Case 1.—An English woman, aged 39, was seen a week after an attack of tonsillitis following a period of general ill health which had culminated in crops of boils 14 days previously. When first examined, the gingiva, both of the maxilla and the mandible, was red, diffusely acutely inflamed, swollen, and painful (*Fig.* 1). There were several gingival abscesses present in interdental papillæ. There was no pocketing and the teeth were not mobile. The submandibular lymph-glands were enlarged and slightly tender. At this time there was a total white cell count of 14,300, with 9500 neutrophils. From serous pus obtained from one of the gingival abscesses, a predominant growth of β hæmolytic streptococci was obtained. The patient was treated with systemic procaine penicillin, 600,000 units twice daily for 6 days, when the condition completely resolved (*Fig.* 2).

Case 2.—An Indian, aged 30, resident in this country. There was no associated history of tonsillitis, but a pericoronitis of the lower left third molar had been present for 5 weeks. Two weeks before he was seen his gums had become sore. When his mouth was first examined, the gingiva of both maxilla and mandible was dull red, showing a generalized acute diffuse inflammation, with swelling of the papillæ. Several gingival abscesses were present in interdental papillæ. Submandibular lymph-nodes were enlarged and tender, there was some toxæmia,

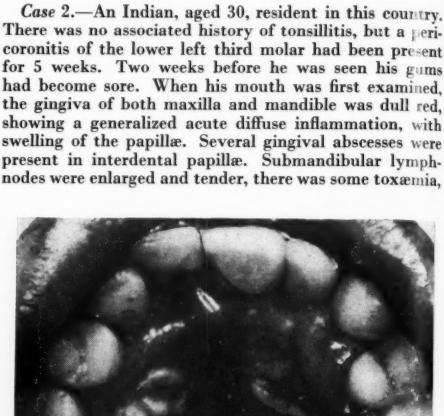


Fig. 4.—*Case* 2. Palatal view, when first seen, showing swelling of gingiva with gingival abscesses palatally adjacent to $\underline{2}|$, $|\underline{3}$ and $|\underline{5}$.

the patient having a temperature of 101·8°. This patient was treated for 3 days with 200,000 units crystalline penicillin and 600,000 units procaine penicillin daily with marked improvement in the condition. However, there was a recurrence 3 weeks later, probably because of too restricted a course of penicillin therapy. When first seen the patient had a total white cell count of 15,000, with 12,600 neutrophils. β hæmolytic streptococci were predominantly cultured from the pus obtained from a gingival abscess.

Case 3.—An Englishman, aged 27. While on holiday on the Continent he had an attack of tonsillitis, followed by bleeding of the gums. This had apparently been treated with systemic penicillin by mouth and, although the tonsillitis cleared up, the gingival condition had persisted. When seen he had a pericoronitis of the lower right third molar. There was an acute generalized diffuse gingivitis with swelling of the interdental papillæ, and a gingival abscess was present palatally opposite the upper central incisor. There was bilateral enlargement of the submandibular lymph-glands and some evidence of toxæmia. Total white cell count was 23,000, with 17,700 neutrophils. Culture from the gingival abscess yielded a mixed growth, chiefly of yeasts, *viridans* streptococci, *Neisseria catarrhalis*, and a few colonies of anaerobic hæmolytic streptococci. This non-specific finding may have been due to the penicillin treatment the patient had been receiving. The gingivitis resolved after 3 days' treatment with 200,000 units crystalline penicillin and 600,000 units procaine penicillin daily.

DISCUSSION AND SUMMARY

From a study of the cases, together with the descriptions in the literature, it is clear

that acute non-ulcerative gingivitis does occur. In many cases there is probably no specific causative organism; and the *viridans* streptococcus, which has frequently been cultured by previous authors, is such a universal oral commensal that its culture from gingival smears is of doubtful significance. It is suggested, however, that though the term "acute streptococcal gingivitis" is not generally justified, it may be accurately used for those cases shown to be associated with β hæmolytic streptococcal infection.

The three cases we have described showed a consistent clinical pattern of generalized acute diffuse inflammation, confined to the gingiva, with gingival abscess formation. In all three patients the oral condition was associated with enlargement of the submandibular lymph-glands and with a raised neutrophil count. All responded well to treatment with systemic penicillin. Two of these cases were associated with attacks of tonsillitis, and in two cases a predominant culture of aerobic β hæmolytic streptococci was obtained.

It is suggested that there is evidence that an acute streptococcal gingivitis due to infection with β hæmolytic streptococci may occasionally occur presenting as a recognizable clinical entity.

REFERENCES

BURKETT, L. W. (1957), *Oral Medicine*, 3rd ed. London: Pitman.

GLICKMAN, I. (1958), *Clinical Periodontology*, 2nd ed. Philadelphia: Saunders.

GOLDMAN, H. M., and COHEN, D. W. (1957), *Periodontia*, 4th ed. St. Louis: Mosby.

MEAD, S. V. (1932), *Diseases of Mouth*, 4th ed. London: Kimpton.

MUMFORD, P. B., and HEPPLESTEIN, A. G. (1943), *Brit. J. Derm.*, **55**, 143.

ORBAN, B. (1958), *Periodontics*. London: Kimpton.

STONES, H. H. (1954), *Oral and Dental Diseases*, 3rd ed. Edinburgh: Livingstone.

THOMA, K. (1954), *Oral Pathology*, 4th ed. London: Kimpton.

PREVENTION OF PERIODONTAL DISEASES*

III. FIBROUS FOODS

By G. L. SLACK, O.B.E., T.D.

IT has long been asserted that dental health can be maintained by a diet containing fibrous food. However, a clear definition of fibrous food and the degree of health which can be achieved is lacking. Obviously there is a point between "fibrousness" and "abrasiveness" which must be specific for each individual; the masticatory forces required and the time taken to chew a certain food are but two factors involved. A common finding in primitive communities is the amount of enamel wear which results from the inclusion in foods of ashes from the cooking fires. The application of this measure to modern civilized communities is obviously impossible. Primitive man who enjoys comparative freedom from dental disease feeds less frequently on foods which differ greatly from the modern diet. There is no chance that the present-day public will eat fibrous foods which are abrasive enough to wear the enamel the right amount and scour the soft tissues sufficiently.

The vast majority of foods described in *The Foods We Eat* (Warren, 1958) scarcely qualify as cleansers with the possible exception of some raw fruits and vegetables. One example is the apple which Knighton (1942) tested for its cleansing qualities. He showed that as a cleaning agent tested by the removal of yeasts from the mouth, the efficiency of apples rated 96·5 per cent; paraffin wax chewed for 30 minutes, 94 per cent; sliced orange, 89 per cent; and tooth brushing for 3 minutes followed by a water rinse, 64 per cent.

In a recent investigation (Slack, 1958) it was found that the eating of selected apples after meals produced a satisfactory result. The gum condition of the children who had apple slices was almost three times better

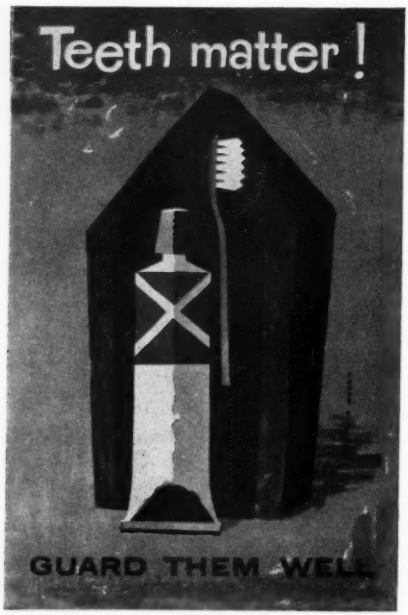
* From a Symposium on the Prevention of Periodontal Diseases given at the meeting of the British Society of Periodontology held on February 9, 1959.

than the control children. The use of apple slices seems to have provided a detergent cleansing food, which stimulated the gum tissues. The measure was very popular amongst the children who co-operated excellently during a two-year period. Although the number of children was small (90 apple and 81 control) the results were most encouraging. Full details of the method have been given in the report. It should be stressed that the type of apple used is very important for so many domestic apples are soft and offer no resistance to mastication.

Although these results were good, more research is needed to discover methods of maintaining good oral health which are readily acceptable by the public.

REFERENCES

KNIGHTON, H. T. (1942), *J. Amer. dent. Ass.*, **29**, 2012.
SLACK, G. L. (1958), *Brit. dent. J.*, **105**, 366.
WARREN, G. C. (1958), *The Foods We Eat.* London: Cassell.



GUARD YOUR TEETH

THE importance of daily dental hygiene and care is again emphasized by a new poster and picture set issued by the Ministry of Health. These are intended for the use of local authorities in the dental education of the public generally and of young children and their parents particularly.

In the new poster a toothpaste tube and brush stand in a sentry box with the message "Teeth Matter! Guard Them Well". The set of four pictures provides guidance on dental hygiene and care, shows how teeth decay, and advises on teeth-building and exercising foods. Practitioners who are interested may make inquiries of the Ministry of Health, Savile Row, London, W.1.

BOOK REVIEWS

FUNDAMENTALS OF GENERAL ANÆSTHESIA FOR STUDENTS AND PRACTITIONERS OF DENTISTRY. By JOHN ADRIANI, M.D., Professor of General Anæsthesia, School of Dentistry, Goyola University, Professor of Surgery, School of Medicine, Tulane University, etc. $10 \times 6\frac{1}{2}$ in. Pp. 213 + xvii, with 61 illustrations. 1959. Oxford: Blackwell Scientific Publications. 50s.

THE object of this book is to give a picture of general anæsthesia which would be helpful to a practising dental surgeon. In the preface the author stresses the fact that any general anæsthetic is a major undertaking, and urges that it should not be undertaken lightly because it is given for the extraction of a tooth. He makes a plea that a dental surgeon should be familiar with the limitations and hazards of various methods, so that he may advise his patients intelligently, even if he has no intention of acting as anæsthetist.

If due allowance is made for the difference between specialized exodontia in the United States and extractions performed by the general dental practitioner in this country, the book is certainly of value to those who do much of their work on patients under general anæsthesia, and should be read with particular care by dental surgeons whose ambition is to give all types of anæsthetics for their colleagues. For the practitioner who has not given an anæsthetic since he qualified, the book gives useful advice and guidance: if all dental surgeons absorbed its contents, fewer miracles would be expected from general anæsthesia.

For the dental surgeon who habitually gives anæsthetics for his colleagues, the book contains useful factual information and some valuable warnings.

The first few chapters deal with the nature of anæsthetics and respiratory physiology. While much of it may be helpful, the inclusion of electro-encephalographic tracings in relation to depth of anæsthesia and the description of controlled respiration and closed circuit techniques can be of little interest to dental surgeons.

When dealing with nitrous oxide anæsthesia, Adriani considers that the only way it may be used without the threat of oxygen lack is by the addition of another anæsthetic such as divinyl ether (vinesthene), trichlorethylene (trilene), ether, or an intravenous barbiturate. Surely under these conditions the credit for safe, tranquil anæsthesia must be given to the adjuvent and not to the nitrous oxide.

After dismissing ethylene as of little use because of explosion hazard, the author devotes seven pages to the equally explosive gas cyclopropane. Only towards the end of this chapter will the dental surgeon realize that he is expected to give the cyclopropane from a closed-circuit apparatus, and intubate the patient with the help of an intravenous injection of a muscle relaxant. Adriani admits that cyclopropane is more difficult to administer than other anæsthetics and warns those unfamiliar with its use that preventable deaths will follow lack of technical skill.

A chapter on the chemistry and pharmacology of the intravenous barbiturates is too complicated for the average reader, but two important facts are stressed. The first is that "there are no such things as stages or planes of thiopentone anæsthesia" and the second is the poor pain-killing properties of all the barbiturates.

A good description of the mode of action of the muscle relaxants follows, but their use in this country is confined to patients on an operating table, not in the dental chair.

The second half of the book deals with clinical considerations. At the onset the point is made that "there is no such thing as a minor general anæsthetic. The administration of a general anæsthetic is a major procedure, irrespective of what it is for and who administers it."

Adriani avoids answering the difficult question about the fitness of the patient for general anæsthesia. He suggests a clinical

examination of the patient by a physician, but does not point out that it is the dental surgeon who gives the anæsthetic whose judgement really matters. Although it is advised that pre- and post-operative blood-pressures should invariably be taken, no guidance is given in the management of patients with readings that are considered too high or too low. It is suggested that an anæsthetic chart be kept, but why the text is illustrated with a chart of anæsthesia for the removal of a gall-bladder is not understood.

The dental surgeon will look in vain for a simple description of nasal nitrous oxide and oxygen anæsthesia. The McKesson apparatus only is described, and a more powerful anæsthetic such as divinyl ether or trichlorethylene is available as an adjuvent to nitrous oxide.

The section on intravenous anæsthesia is excellent. A warning is given to resist the temptation to give a relative over-dose of an intravenous barbiturate in order to compensate for the weak pain-killing properties and abolish reflex response to a stimulus.

The ease with which an intravenous barbiturate can be given overshadows some of the difficulties which beset this method of anæsthesia. The book is particularly useful in warning the dental anæsthetist of the threat of laryngeal spasm. Adriani goes as far as stating ". . . the stage is set perfectly for development of severe laryngeal spasm when thiopentone is used as the sole agent for exodontia in the sitting position". He discredits the findings of some American dental surgeons who have recorded thousands of cases with very few complications: his comment is "Fools rush in . . . applies to intravenous anæsthesia in the surgery."

The chapter on resuscitation is helpful in that it stresses the importance of getting oxygen into the alveoli of the lung, and adds that nothing can be injected with a syringe from an ampoule which will take the place of oxygen.

The book should certainly be read by those dental surgeons who customarily give anæsthetics for their colleagues and particularly by those who propose to use intravenous methods. For the occasional anæsthetist it differs too widely from the accepted practice in this country to be of any great value. W. S. McC.

AN INTRODUCTION TO SURGERY FOR DENTAL STUDENTS. By R. P. Jepson, F.R.C.S., Professor of Surgery, University of Adelaide; and B. N. Catchpole, F.R.C.S., Lecturer in Surgery, University of Sheffield. $8\frac{1}{2} \times 5\frac{1}{2}$ in. Pp. 166 + x, with 53 illustrations. 1959. London: The English Universities Press Ltd. 21s.

The key-word in the title of this book is "introduction". This is a brief and simple text, clearly written, and entirely suitable for a student who has no previous knowledge of surgery. The lesions used for the illustrations are largely of the head and neck, and the dental student will therefore have no difficulty in understanding their significance. Some illustrations, however, are less valuable from the point of view of his general surgical knowledge.

The inclusion of a chapter on diseases of the eye is to be commended, but it is a pity that a moderate amount of space is devoted to lesions of the teeth, tongue, and jaws. In a short book like this, oral lesions, which are dealt with at much greater length in purely dental text-books, could well have been omitted altogether.

It is a pleasure to find a new book suitably priced for the student's pocket, but the reviewer feels that any subsequent edition could well be considerably expanded, so that it might serve the student throughout his general surgical course instead of only at its commencement. G. R. S.

CLINICAL DENTAL HYGIENE. Edited by Shailer Peterson, B.A., M.A., Ph.D., Secretary, Council on Dental Education of the American Dental Association. $9\frac{1}{2} \times 6\frac{1}{4}$ in. Pp. 348, with 161 illustrations. 1959. St. Louis: The C. V. Mosby Company. (London: Henry Kimpton.) 51s.

There is no doubt that the dental hygienist has come to be recognized as a member of the dental health team. The dental hygiene profession will be pleased to learn of the

existence of this book, which in its twelve chapters submits practically all the information that a student of dental hygiene would wish to know.

The chapters have the following headings: Orientation to clinical dental hygiene; the patient and the dental hygienist; relationship between clinical dental hygiene and the basic sciences and general education; an introduction to oral prophylaxis; deposits on teeth; instruments and chairside assisting; dental materials and their application; an introduction to dental roentgenology; case histories; oral charts and radiographs; methods of sterilization; appointment procedures and recall systems; role of the dental hygienist in preventive dentistry.

The majority of the excellent instructional photographs are well reproduced and add greatly to the value of the book. There are some typographical errors which should be taken care of in the next edition. At the end of each chapter several references are given which help to locate relevant reading matter; questions are well set out to assist revision of the knowledge gained. It is possible that a trained dental hygienist could well assist a dentist at the chairside and with that view, chairside assisting is well catered for. On the whole it is a very useful book which should be read not only by the student hygienist but also by every chairside assistant and those interested in dental hygiene. H. M.

OCCLUSAL EQUILIBRATION AND TEMPOROMANDIBULAR JOINT DYSFUNCTION. By NATHAN ALLEN SHORE, D.D.S., Instructor in Occlusal Equilibration and Temporomandibular Joint Dysfunction in the Post-graduate Schools of the First, Second, Third, and Tenth District Dental Societies of the New York State Dental Society. 10×7 in. Pp. 323+xiv, with 242 illustrations. 1959. Philadelphia and Montreal: J. B. Lippincott Co. (London: Pitman Medical Publishing Co. Ltd.) £5.

THIS is not an easy book to review fairly and critically for at one and the same time it seems to be a work for the general dental practitioner and also for the specialist. In his preface the author states that his reason for writing this book was that while delving into the topic of temporomandibular joint dysfunction and occlusal equilibration he found a voluminous literature in many languages in the fields of periodontics, prosthodontics, orthodontics, and others, often from contradictory points of view. In the final chapter the subject of the book is said to be "the cause and the effect of the degeneration of the stomatognathic system".

The first quarter of the book is devoted to the biomechanics of tooth movement, histologic reactions to force, and the physiology of the stomatognathic system. This is followed by a chapter in which an extremely detailed method of diagnosis for cases of temporomandibular joint dysfunction is described. Such dysfunction and radiographic examination of the joint are considered next and the final 100 pages of the book are devoted to re-shaping of the occlusal surfaces of the teeth.

It is easy to pass adverse comment on a work dealing with such a difficult subject, but the author has done well and it would be foolhardy to pick out isolated remarks for comment. Dr. Shore is obviously a practitioner who appreciates the very great significance of the occlusal relationship, and no dentist would be wasting his time by reading this book.

Some would consider the space devoted to occlusal re-shaping disproportionate, and would have wished more to have been written about the orthodontic, restorative, and prosthetic aspects of occlusal equilibration. These aspects are fully appreciated by Dr. Shore and he presents them in their correct perspective, but states that their more detailed consideration has to be left to the wider topic of oral rehabilitation. It is also a pity that post-treatment radiographs are not included in the ten case histories which conclude the book.

The standard of production is very high, the double column large size print being easy to read, and the excellent illustrations are profuse but not excessive.

A book which should be read by any dentist who aims to be more than a technician.

A. B. W.

MODERN MEDICINE

EXTRACTS OF PARTICULAR INTEREST TO THE DENTAL PRACTITIONER FROM THE MEDICAL PRESS

Fluothane

Fluothane, a relatively new anæsthetic, has been used in anæsthetics on over 100,000 patients of all ages and for all types of surgical operations. It is a clear colourless liquid with a sweet, pleasant, and non-irritant odour resembling that of "trilene" or chloroform. When mixed in any concentration with oxygen or oxygen and nitrous oxide, fluothane is non-explosive and non-inflammable.

The following are characteristic features of its administration: A smooth and easily reversible anæsthesia with a degree of relaxation that is adequate for most operations. There is suppression of salivary, bronchial, and gastric secretions, and absence of the shock syndrome during and immediately following surgery. A very rapid and uneventful recovery with relative freedom from nausea and vomiting is usual.

Fluothane is a powerful and rapidly acting anæsthetic agent which is quickly excreted. It therefore gives the anæsthetist excellent control over the depth of anæsthesia, but can rapidly lead to overdosage if it is mishandled.

In dentistry, nitrous oxide used on its own has two disadvantages as an anæsthetic. It calls for a certain degree of hypoxia which can result in permanent damage to the patient, and it needs reinforcement in resistive patients. Trichlorethylene, also commonly used, is relatively satisfactory, causing few after-effects.

In 300 unselected patients requiring extractions, the patients were divided into equal groups which received respectively nitrous oxide and oxygen, the same with trichlorethylene, and also with fluothane. A Walton Mark II machine was used, and the trichlorethylene or fluothane were vaporized from a Rowbotham vaporizer inserted between the machine and the reservoir bag.

Both these agents were turned on after the patient had been given pure N_2O for a few breaths. Both trichlorethylene and fluothane helped to provide smoother anæsthesia in patients expected to be resistant, but fluothane was considerably better in this respect. Fluothane also enabled a higher supply of oxygen to be given without lightening the anæsthesia too much.

Fluothane, also known as Halothane, is a useful additive to nitrous oxide anæsthesia in the dental chair. It permits the abolition of hypoxia, which usually accompanies the use of the gas in unpremedicated out-patients. This is probably of greatest value when anæsthetizing the aged or those with pathological conditions, rendering them more than usually susceptible to the effects of hypoxia. The drug is of value in controlling the anæsthetic resistant patient without hypoxia or delay in recovery, and it provides operating conditions and a tranquillity of anæsthesia not attainable by other methods.—WALSH, R. S. (1958), *Brit. J. Anæsth.*, **30**, 578. *Fluothane.* Imperial Chemical Industries.

Modern Steroid Therapy

Steroids have a dramatic influence in the treatment of a wide variety of diseases. C. L. Cope discusses the principles of their use.

Research by Kendall and Reichstein resulted in the synthesis and preparation of several adrenal steroids including cortisone, and it was this small accumulation of cortisone which Hench was able to use for his famous trial in patients with rheumatoid arthritis, the results of which led to a Nobel prize for all three investigators. Since then the chemistry and physiology of these compounds have been greatly developed.

Under ordinary conditions hydrocortisone and probably also some corticosterones are steadily produced in the adrenal cortex. The concentration of hydrocortisone in the blood varies between 5 and 25 µg. per 100 ml. The hormone passes via the adrenal veins into the general blood-stream and diffuses into the other body fluids, in most of which it has now

been identified. The rate at which it is produced varies under different conditions. Exercise probably raises it, as does stress or trauma such as infection, an accident, or an operation. Pregnancy causes a rise in output to probably more than twice normal. Why raised plasma levels of hydrocortisone are needed under such varied conditions is not really known, but there is no doubt that they greatly assist the organism to withstand the effects of an adverse environment.

Automatic control of production in the adrenal is brought about by the pituitary hormone corticotrophin. The amount of this which is secreted is determined by the prevailing hydrocortisone blood-level. A sudden rise in blood-level of the hydrocortisone from any cause will promptly cause production of the pituitary corticotrophin to cease, and as a result the adrenal cortex subsides into an inactivity which may indeed be complete.

The adrenal also produces a hormone, aldosterone, which is a potent natural controller of sodium and potassium metabolism.

All the ordinary steroids available for therapeutic use, such as cortisone acetate, hydrocortisone, prednisone, and prednisolone acetate, are active when taken by mouth and are available as tablets. Preparations suitable for intramuscular and intravenous administration are also available. Apart from the general systemic methods of administering the steroids, they may be applied locally to the diseased site itself. A suspension of hydrocortisone acetate crystals may be injected into joints; soluble forms of steroids are applied to mucus membranes; ointments and lotions are applied topically in skin diseases, frequently combined with antibiotics such as neomycin, tetracycline, polymixin, or bacitracin to combat associated infections. Eye and nasal drops are also used.

So far no adequate explanation of the therapeutic action of the steroids has been given. What is evident is that they reduce very strongly the manifestations of inflammatory reactions, the hyperæmia, the œdema, the swelling, the fibroblastic activity and proliferation, and often the pain. The types of inflammation most readily inhibited in this way are those usually regarded as of unknown aetiology. Allergic reactions are similarly benefited in equally dramatic manner. If the cause of the disease is bacterial the inhibition of the normal inflammatory resistance to bacterial invasion can quickly have disastrous consequences. It is thus essential for a full diagnosis to be made before steroid therapy is started.

Steroids, in addition to local effects, inhibit some of the general manifestations of disease. Fever is usually lowered, often to normal; the sedimentation rate, if raised, is usually reduced; general malaise may be replaced by a sense of well-being and even euphoria. These changes are non-specific effects of the adrenal steroids, and by no means indicate necessarily that the disease is being favourably influenced. Indeed, they may wrongly suggest that good is being done rather than harm. Some of the effects of steroid therapy are undesirable. For example, most of them tend to cause sodium retention with resultant œdema. Another effect which can have serious clinical import is the provoking of a negative calcium balance due to increased fæcal excretion with loss of mineral from the skeleton and ultimate osteoporosis. Patients on systemic steroid therapy should carry on their person a statement that they are receiving steroids and an indication of the dose so that should an accident occur, resulting in unconsciousness, their steroid intake will not be interrupted. In addition such patients should also be instructed on the need for increased amounts during periods of stress such as infection trauma or operation, and should have steroid tablets constantly available.—COPE, C. L. (1959), *Brit. med. J.*, **1**, 1583, 1620.

ERRATUM

The Ansafone

It must be pointed out that there is no pre-set recording time as was previously stated in the DENTAL PRACTITIONER (Vol. IX, Nos. 11, 12, p. 295). The Ansafone will record a message for as long as the caller is talking, but will not accept a call if there is less than three minutes recording time left.

LETTER TO THE EDITOR

October 5, 1959

Dear Sir,

Most of us are indolent by nature but let us not attempt to justify this in print. In his recent letter to the Editor, Mr. G. E. Ray appeals to the weaker elements in our make-up by specious argument and thus gives an example of the attitude that is so roundly and rightly condemned in the June editorial.

Let me take Mr. Ray's points one by one:—

1. "It is by no means proven that polishing amalgams is advantageous." It is not proven that polishing is harmful and there are reasons other than scientific ones why they should be polished.

2. ". . . cannot polish . . . inaccessible parts . . . electrolytic action may occur . . ." First, there are no inaccessible parts in Class I and Class V restorations. Secondly, corrosion is thought to be due to different electrical potentials between non-homogeneous portions of the amalgam surface, and polishing all the accessible parts will at least get rid of a large proportion of these by producing a homogeneous layer (Skinner, 1954).

3. "We are seriously ignorant of the effect of surface changes which occur during polishing." We are seriously ignorant of many things in this world but if ignorance is to produce such negatory action as Mr. Ray advocates we should rarely do anything.

4. "A polished restoration will soon lose its polish if a typical toothpaste is vigorously applied." This will be news to many of us.

I am glad that Mr. Ray sanctions at least a smooth surface for amalgams and occasionally out of pride of workmanship sets to and polishes. This cannot be very often, however, if both poorly kept mouths and those to which toothpaste is vigorously applied are excluded.

Mr. Ray's letter seems to me both irresponsible and lacking in common sense and it is all the more unfortunate in that it is penned by a man known by the general practitioner to have contributed many articles to the dental literature.

May I in conclusion say that to polish an amalgam:—

1. Gives satisfaction to the dental surgeon in seeing a job well done. No proof required.

2. Gives satisfaction to the patient both from the appearance and the feel. No proof required.

3. Reduces the likelihood of corrosion (Schoonover and Souden, 1941; Swartz, Phillips, and Tannir, 1958). To quote Skinner, p. 284: "If an amalgam restoration is highly polished after it has thoroughly hardened its resistance to corrosion is greatly increased. The presence of the polished surface evidently produces a homogeneous layer which is resistant to chemical attack. The polished surface may tarnish slightly but it does not usually corrode."

4. Reduces the available retention for foodstuffs. Proof by common observation. This may have an effect on caries recurrence: it certainly feels better to the patient.

Any one of these reasons will be sufficient for the conscientious practitioner to allow his common sense to prevail in the absence of scientific proof.

Yours faithfully,

J. R. GRUNDY.

53, *Delamere Road,*
Gatley, Cheshire.

SCHOONOVER, I. C., and SOUDER, W. (1941), *J. Amer. dent. Ass.*, **28**, 1278.

SKINNER, E. W. (1945), *The Science of Dental Materials*, 4th ed. Philadelphia: Saunders.

SWARTZ, M. L., PHILLIPS, R. W., and MOHAMED DAOUD EL TANNIR (1958), *J. dent. Res.*, **37**, 837.

Antibacterial Action of Fluoride-containing Dental Materials

An investigation of the antibacterial effects of certain fluoride-containing dental materials against seven different micro-organisms is described. No indication of bacterial growth was observed when low concentrations of fluorides were added to resins or zinc-phosphate cements.

Silicate cement has an antibacterial action when in the plastic state; it is thought to be due to the content of the highly antibacterial phosphoric acid. The results of the study give increased support to the theory that the lower incidence of recurrent caries associated with silicate restoration is due to decreased solubility of the tooth structure adjacent to the restoration.—MANGI, S. L., SUMMERS, W. A., PHILLIPS, R. W., and SWARTZ, M. L. (1959), *J. dent. Res.*, **38**, 88.

Heredity and Dental Caries

In a study of dental caries in identical and like-sex fraternal twins a total of 224 pairs of the latter in the age range of 5–17 years was examined. Of this total 96 pairs were identical and 128 pairs fraternal. An unrelated child of the same age, sex, and with the same number of erupted teeth as one of the twins was paired with one child providing a control pair. The subsequent comparison of corresponding teeth showed that resemblance in dental caries experienced between identical twins is greater than between fraternal twins and between unrelated pairs.

The data from the study taken with previous findings allowed the conclusion that environmental factors clearly have greater influence, but that genetic factors also contribute to the causation of dental caries.—MANSBRIDGE, J. N. (1959), *J. dent. Res.*, **38**, 337.

IMPACTED SECOND MANDIBULAR MOLARS

By **DOUGLAS MUNNS**, L.D.S. R.C.S. (Eng.)

As several cases of impacted permanent second mandibular molars have been discovered during routine orthodontic examinations, my interest has been aroused. Taking into account the teeth of both the deciduous and permanent dentitions, impactions of the mandibular second permanent molar occurs very infrequently; of the various workers who have investigated the condition, the highest figure recorded is 0·5 per cent of all impactions under review by any one author.

Several cases of these impactions have been reported over the past ten years but with one exception (Jackson, 1951), all have referred to gross impactions and not the mild mesioangular impaction under discussion in this paper. In 1952 Adamson did discuss "The problem of impacted teeth in orthodontics" but makes no mention in his paper of the impacted second permanent molar teeth. No other references can be found to this anomaly as it affects orthodontic procedures.

Fig. 1.—*Case* 1 at 13 years 6 months.

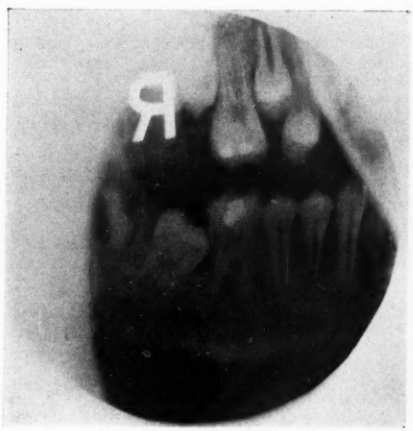


Fig. 2—*Case* 2 at 11 years 2 months.

In presenting the following cases I am very conscious of two things: the first is that having discovered an abnormality in one patient, one tends to look for it in every patient entering the surgery, and if you are not careful you could see a tendency towards an abnormality when it is not really present, and for this reason several doubtful cases are not included in this series; the other is that angulation on radiographs can be very deceptive and can give the

Given at the Manchester meeting held on April 17, 1959.

appearance, due to overlapping, of an impaction, and although only one view of each case is printed here, more than one view has been taken to eliminate this possible error. I hope

Fig. 3.—Study models, *Case* 2. *Top*, before extracting $\overline{6|6}$; *bottom*, 10 months after extraction.

you will not find me guilty of the former in the following cases. I propose not only to consider what bearing the facts have on the development of the mandible and the forward drift of the teeth as described by Brash (1952) and others, but also what influences the possibility of impacted second molars later should have on our treatment plan.

We know that during eruption the lower molars rotate in an arc upwards and forwards, and I would suggest that in many cases they appear to almost slide up the distal aspect of the first molar as development proceeds.

CASE REPORTS

Case 1.—*Fig.* 1 shows a mesio-angular impaction of the right mandibular second molar, at the age of 13½ years, which had given some slight pain about two months before this X-ray was taken. After much discussion with the father, a dental surgeon, this second molar tooth was removed as although there was a danger of injuring the developing third molar and therefore the extraction of the first molar would have been the easier course to adopt, it was considered that the second molar would then never have erupted into a good position and so there would be considerable loss of occlusion on this side of the mouth. I think this case illustrates the difficulty that one is up against when one is faced with an impacted second molar in the surgery when orthodontic intervention is no longer possible. His father tells me that all his deciduous teeth were lost naturally, except both maxillary canines and second molars, but even these were only extracted a few months before their permanent successors erupted.

Fig. 4.—*Case* 3 at 15 years 3 months.

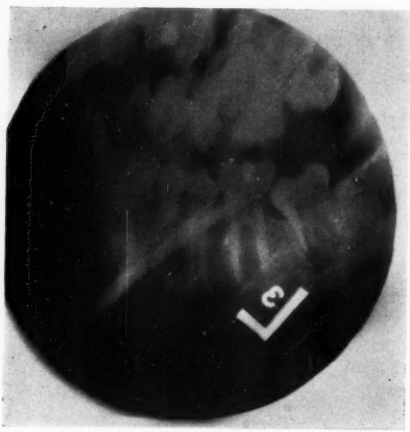


Fig. 5.—*Case* 4 at 13 years 3 months.

Case 2.—This patient, aged 11 years 2 months, was referred to me by the school E.N.T. surgeon as he could find no cause for the severe pain the patient had in both her ears over a considerable period of time. On examination of the mouth, there were no carious teeth, but there was a very irregular bite on the molar teeth, and X-rays (*Fig.* 2) showed impacted second mandibular molars on both sides of the mouth. Here again, there is little in the past history to help us as all the deciduous teeth, with the exception of the two maxillary first deciduous molars, were lost naturally, although there was a space of some two years between the shedding of the left mandibular second deciduous molar and the eruption of its permanent successor. It was decided to extract the two mandibular first molars, and *Fig.* 3 shows position of teeth before treatment and ten months afterwards (the $\underline{|6}$ was lost due to caries). I am not so sure that even in this case it would not have been wiser to extract the impacted second molars. Could this deformity have been prevented if an earlier diagnosis had been made and, say, all first permanent molars removed several years earlier?

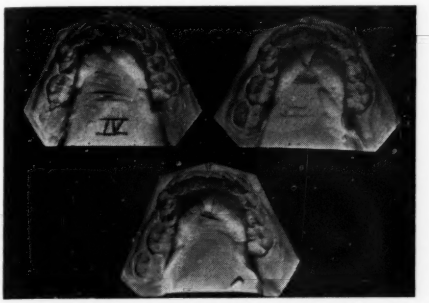


Fig. 6.—Lower models, *Case* 4. *Top left*, at 13 years 3 months; *top right*, at 14 years; *bottom*, at 14 years 8 months.

Fig. 7.—*Case* 5 at 10 years 6 months.

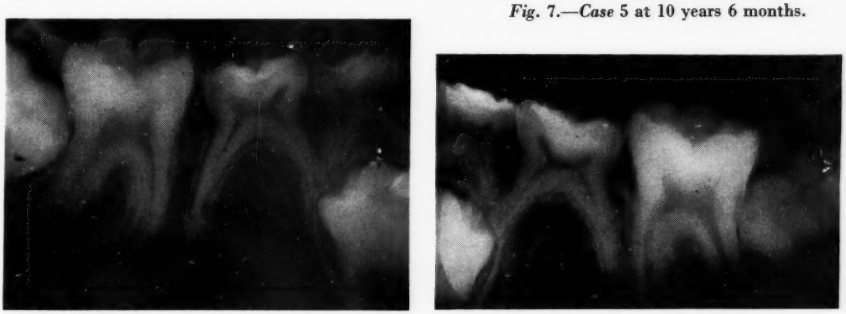


Fig. 8.—*Case* 6 at 8 years 10 months.

Case 3.—Another example (*Fig.* 4) of impacted second molar in a patient aged 15 years 3 months. There were no symptoms in this case and the abnormality was only found on routine examination of the mouth.

Case 4.—In this case (*Fig.* 5), a patient aged 13 years 3 months, we have a definite history of an early loss of deciduous teeth and definite overcrowding in the premolar regions. Is this a case where the first molar has tilted forward owing to the early loss of the deciduous teeth, but when the permanent teeth have erupted the force of these teeth has caused the first molar to upright again and so "catch" the second molar beneath the distal part of the crown? *Fig.* 6 shows lower models at 13 years 3 months, 14 years, and 14 years 8 months; no lower appliances have been worn.

Case 5 (*Fig.* 7).—A little girl, aged 10 years 6 months, with a rather similar impaction to the previous case. She has a history of early loss of deciduous molars on this side of the mouth. There is no impaction on the left side.

Case 6.—This case is of interest, as I think the abnormality could have been corrected if the deciduous second molars, having no successors, had been extracted

when X-rays (*Fig.* 8) were taken at the age of 8 years 10 months. However, when I first saw him 16 months later (aged 10 years 2 months) he had impactions of both second molars (*Fig.* 9). Will the removal of the second deciduous molars now allow the occlusion to be corrected

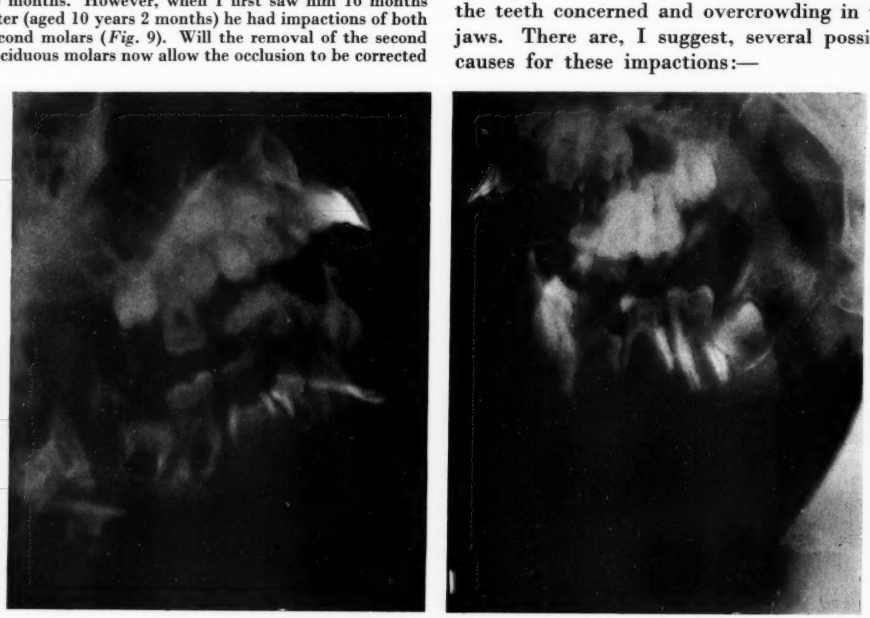


Fig. 9.—*Case* 6 at 10 years 2 months.

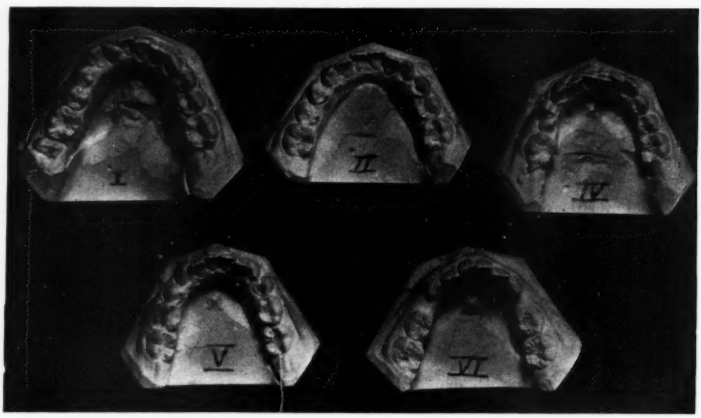


Fig. 10.—Original lower study models of *Cases* 1, 2, 4, 5, and 6.

or are we going to have tipped first and second permanent molars with permanent periodontal damage?

DISCUSSION

I think that both the lower models (*Fig.* 10) and the summary *Table I* show that there is a definite connexion between the impaction of the teeth concerned and overcrowding in the jaws. There are, I suggest, several possible causes for these impactions:—

1. Owing to the overcrowding, the teeth have not migrated forward to the desired degree, with the result that there is insufficient room for the developing second molar and, owing to its general line of growth, it has

become impacted against the distal aspect of the first molar. I think that overcrowding in the maxilla is of equal importance as overcrowding in the mandible in these cases in that locking of the bite has prevented normal tooth movement.

2. Once the second deciduous molar has been shed, or extracted, there has been a forward movement of the first molar, but when the premolars have erupted there has been a slight backward tilt of the first molar, and again the developing second molar has been caught under the distal part of the crown of the tooth in front.

3. In three of these cases (50 per cent) the third molar is either missing altogether or is just a rudimentary tooth, whilst in *Case* 2 there is likely to be a severe impaction. Is this of developmental significance in these individuals in that there is now no room for these teeth? Indeed, development is such that the second molars are now impacting.

I am not suggesting that diagnosis in these cases is easy, for in *Fig.* 11 we have an example of what, at the age of 10 years 6 months, looked as if it might well be an impaction but at the age of 13 there is a completely different picture (*Fig.* 12). Whilst it now appears that the third molar will be impacted, vertical growth of the alveolus is still going on and it may well be that this tooth will eventually erupt normally.

Fig. 11.—Position of teeth at 10 years 6 months.

Fig. 12.—Same patient as *Fig.* 11 at 13 years.

Table I.—SUMMARY

Case No.	Age	Class	Impacted Teeth	History of Early Loss	Overcrowding in Lower In. Region	Overcrowding in Upper In. Region	Overcrowding in Lower Pre. Region	Probable Impaction 8
1	13.7	I	$\overline{7}\vert$	EC|CE	No	Slight	No	No
2	11.2	I	$\overline{7}\vert\overline{7}$	D|D	Slight	No	No	Yes
3	15.3	I	$\overline{7}\vert$	—	—	—	—	No
4	13.3	I	$\overline{7}\vert$	Yes	No	No	Yes	Absent
5	10.6	I	$\overline{7}\vert$	No	Yes	Yes	Possibly	Rudimentary
6	10.2	II (1)	$\overline{7}\vert\overline{7}$	$\overline{D}\vert\overline{D}$	Yes	Yes	Yes	Absent

Another case has recently been brought to my notice where impacted second molars were extracted at 15 years of age and now at 19 years, there is a mesio-angular impaction of one of the third molars! In 1956 Bjork, Jensen, and Palling showed that to some extent it was possible to determine whether third molars were likely to be impacted or not; on the other hand Smith (1957) has shown that by extracting the second molar one cannot guarantee a good position of the third molar.

Whether or not it will be possible in the future to draw any similar conclusions in regard to impacted second molars it is impossible to determine from this short series of cases.

SUMMARY

Six cases of impacted second mandibular permanent molars have been reported and the cause of this anomaly and its possible influence on orthodontic diagnosis and treatment planning discussed.

Acknowledgements.—I am grateful to the North-West Metropolitan Regional Hospital Board and to the Northern Group Hospital Management Committee for their co-operation in the preparation of this paper.

REFERENCES

Adamson, Kenneth J. (1952), *Aust. J. Dent.*, **56**, 74.
Bjork, A., Jensen, E., and Palling, M. (1956), *Trans. Europ. orthod. Soc.*, 164.
Brash, J. C. (1952), *Trans. Brit. Soc. Orthodont.*, 97.
Jackson, Mayo (1951), *Brit. dent. J.*, **91**, 294.
Smith, D. I. (1957), *Trans. Brit. Soc. Orthodont.*, 55.

DISCUSSION

The President said he wished to thank Mr. Munns for putting the problem before them and discussing certain cases. It was astonishing how frequently a problem presented itself when one became interested in it.

Mr. D. A. Dixon thanked Mr. Munns for an excellent series of cases. He was interested in impacted first molars, and thought they presented many similar problems. All the cases referred to were in the lower jaw. First molar impactions also occurred in the upper jaw especially in the mixed dentition. The problem of crowding was present in most cases, but not in all. Some cases showed spacing of the anterior teeth, and deciduous molars or pre-molars, with impactions at the back of the mouth.

Mr. G. C. Dickson thanked Mr. Munns for an interesting paper. Presumably an answer was wanted to the question, "Has it any developmental significance?" He could answer that from his own limited knowledge: for two reasons, it could not have. First, there could not be any evaluation in the matter of selection and the closest investigation seemed to show there was no natural selection on the grounds of impaction of second molars. Secondly, the period during which malocclusions had been under investigation (from Anglo-Saxon times) was far too short in connexion with evolutionary changes to make any difference at all.

However, it might be said that the shortening of the dental arches and the occurrence of overcrowding and impaction in various forms could be attributed to lack of natural selection and the result of racial hybridization, which gave a wider range of variation in the size of teeth and the dental arches. Those variations were not eliminated by selection but did persist.

Mr. E. K. Breakspear said that he, too, would like to congratulate Mr. Munns, whose list of causes was a good one. But a further item might be added to that list—namely, appliance treatment. It was important to ensure that the second and third molars were kept under observation when any appliance was inserted to maintain or increase premolar space in the lower arch.

Mr. D. Munns, in reply, thanked the meeting for their reception of the paper. They all attended for the purpose of learning as much as they could, and he had certainly learnt something from the discussion. The only matter he proposed to answer was that raised by Mr. Breakspear concerning appliances. None of the cases in question had worn any appliance up to the time when he saw them. Whether they should have done so or not was another matter. When we see impacted second molars occurring at the end of orthodontic treatment, then we shall have to start thinking again.